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FIFTEENTH YEAR.

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—BY—

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THE "Story of a Great Monopoly" is vividly told in the *Atlantic Monthly*. The monopoly that will promptly suggest itself under this title to the citizens of Cleveland as well as to the directors of railway companies, will be, as a matter of course, the Standard Oil Company,—to the former because Cleveland is its headquarters, and to the latter for the unprecedented service done to the Standard by the great trunk line companies which diverted the profits which they might have secured for the transportation of oil into the coffers of the Standard. Not only have the trunk lines carried for the Standard at rates below those granted to other companies, but in addition presented them with one-half to three-quarters of the actual cost of transportation. The secret of this potent power to make railways subservient to the purposes of the S. O. C. is attributed by the world to the assertion of the basest influences among the directors of the lines that became servitors to the Standard. Rockefeller and several of his coadjutors, were directors of roads that played into its hands; and there is also the fact of the confessed losses of the New York Central, Pennsylvania and Reading through their alliance with the Standard. The latest report of the Reading gives a great deal of space to its heavy losses on this account. Was it on account of this robbery of railway shareholders, the iniquity of the compact between the lines concerned, the conspiracy against independent individual and corporate rights, that the Standard Company when before the New York Railroad Investigating Committee declined giving a history of their organization, business and transactions, on the ground that "their testimony might be used to convict them of crime"? These are not our words; they appear in the report of the Committee presented to the Legislature and ordered to be printed.

It is well known that in 1879 the production of oil in Pennsylvania reached 20,000,000 of barrels, that some 3,800,000 barrels remained stored in the oil region, and 16,200,000 barrels were transported from the region. Of the quantity transported 12,800,000 came to tide-water, and of these 11,400,000 barrels were actually shipped to foreign countries. The magnitude of the traffic is obvious, and the enormous profit that might have been made out of it apparent, but, as we have said, not only was the profit foregone in the case of the Standard from even carrying its oil at a compensatory rate, but, in addition, from one-half to threequarters of the actual cost of transportation was also added to the magnificent donation made by the trunk lines to the Standard Oil Company. The published rate for carrying oil at the outset of production on a large scale was $1.40 per barrel to New York, and $1.25 per barrel to Philadelphia, and such a rate is what the traffic could at all times have produced to the railway companies. But with this published rate the Standard conveyed its oil at about eighty-five cents a barrel. The result was that no one could transport oil but the Standard Oil Company, and that, with the exception of three or four refineries, none survived the unfair oompetition with this Company. The railroad companies justified this special rate on account of the magnitude of the business of the Standard Oil Company, but the latter would have been unable to ship more than anybody else, with equal capital, if they had not secured the favored rate. There were some producers of oil who refused to submit to the sway of the Standard Oil Company, who refused to be told that they could not have oil transported unless they sold it to the Standard Oil Company; and some of the gentlemen appealed to the Reading Railroad Company to carry their oil. They were told by the Reading that its line was at least one hundred miles distant from the oil regions, and that it had not the money to build a connecting road. They replied that they would construct a pipe line to reach the road. They had no right of eminent domain, and could not take land to lay their pipe against the wishes of the owners. They succeeded, however, in buying the ground for the purpose of establishing a pipe line, and they laid a 6 inch pipe a distance of one hundred and four miles, and connected it with the Reading railroad at Williamsport. They erected their machinery and delivered their oil; and the Company agreed to give them a reasonable rate, and agreed that it would not carry at a less rate for anybody else. No sooner, however, did the Reading begin to fulfil its agreement, than a meeting of the trunk lines was held at Saratoga, at which the representatives of the Standard Oil Company were present, and on that day the through rate on oil was reduced to twenty cents per barrel to the Standard Oil Company. Subsequent action reduced the amount of crude oil to fifteen, and still later to ten cents, so that instead of getting even eighty-five cents per barrel —or even cost, which would be from thirty-five cents to forty-five cents per barrel, the trunk lines were carrying the valuable traffic in great quantities, at what must be considered a nominal figure.

The lines now charge as an open rate to the public $1.90 to New York for each barrel of refined oil, and $1.10 and $1.20 a barrel less to the Standard. At a railroad meeting on January 21, 1880, the President of the Baltimore & Ohio Railroad called the attention of the other trunk line Presidents to the "wasteful and absurd rates of oil," which virtually for the Standard amounted to free transportation, but the reference was without effect. The present rebates to the Standard are about equal to the average value of the oil in wells.

Having made these observations, presenting facts lying within our own knowledge, we may say of the article in the *Atlantic Monthly* that whilst a really good story, abounding with financial manœuvres, it constitutes, in the facts presented, a serious moral indictment against those who have been concerned in promoting the fortunes of the Standard. After enumerating in detail the history of the development of the Standard, which has all the characteristics of a secret organization, its proprietary being unknown, and its path like a serpent on a rock, the writer observes:

Hundreds and thousands of men have been ruined by these acts of the Standard and the railroads; whole communities have been rendered desperate, and the peace of Pennsylvania imperiled more than once. The thousands of men thrown out of employment in Pittsburgh between 1872 and 1875 were actors in the Pittsburgh tragedy of July, 1877. The oil producers, in their memorial to Governor Hartranft, August 15, 1878, for help declared that "the Standard and the railroad companies leave to the people, whose creatures they are, but two remedies—an appeal for protection first to the law of the land, and next to the higher law of nature!" The very intelligent and fair correspondent of the New York Sun, whom the Standard could not seduce, as it did the representative of another great New York daily, wrote from Titusville, Pa., November 4, 1878: "The fact is the State of Pennsylvania has had a narrow escape from an internal war, that would have required all its resources to control and check, and the danger is not over yet. * * * Had certain men given the word there would have been an outbreak that contemplated the seizure of the railroads and running them, the capture and control of the United Pipe Line's [the Standard's] property, and in all probability the burning of all the property of the Standard Oil Company in the region. The men who would have done this, and may do it yet, are not laborers or tramps. They are men who believe in order and law, and have business to attend to."

The following comes home to all consumers:

"To-day in every part of the United States, people who burn kerosene are paying the Standard Oil Company a tax on every gallon amounting to several times its original cost to that concern. The average price of crude oil at the wells or at Cleveland, as the railroads carry the crude free to the Standard's refineries, was in December last about three cents a gallon Oil that the Standard sells in New York at a profit, at ten and one half cents a gallon, they charge nineteen and three fourths cents for in Chicago. The average cost, last December, of the one and a third barrels of petroleum needed to make a barrel of kerosene was $2.05 at Cleveland. The cost of refining, barreling, and all expenses, including a refiner's profit of half a dollar a barrel, is, according to the testimony of experts, $2.75 a barrel. To bring it by rail to Chicago cost seventy cents, making the total cost $5.50 for a barrel of fifty gallons, or eleven cents a gallon. The price the Standard charges in Chicago is nineteen and three fourths cents a gallon, in which, as the difierence between eleven and nineteen and three fourths cents there is a tax on the public of eight and three fourths cents. This tax is transmitted by the middle-men, jobbers, and retailers to the consumer. When at twenty-five cents a gallon the workingman buys kerosene because it is cheaper than gas or the student because it is better, each pays the Standard this tax of eight and three fourths cents a gallon.

THERE is much experimenting at the present time going on in steel plates for boilers, the experimenting, however, being of that practical character which comes from use. The remarks made by a manufacturer in this line, quoted by the U. S. Supervising Inspector General of Steamboats, certainly supply a theory which may account for the explosion of the steam boilers of the Livada, the costly steam yacht constructed in England to the order of the late Emperor of Russia. The individual consulted by the Inspector, speaking for his firm, observes: We could furnish steel plate 70,000 lbs. tensile strength just as easily and cheaply as 60,000, but are not willing to make a move in so wrong a direction. We should much prefer steel plate 50,000 lbs. tensile strength in a boiler of our own than 70,000. Steel so high in tensile strength must be high in carbon, and when high in carbon will harden with fire and water, or to put it more clearly, will temper. No steel plate should be used in a boiler that will not bend flat after being heated red-hot and cooled quickly in water. Hard steel will also crack much more easily and will not yield to unequal strains, one part, manifestly, will have to take the whole, or a great part of the pressure, and be ruptured, just as an army which might be able to hold its own in a solid body is easily defeated in detail. Moreover, we think that when a boiler made of tough material instead of a hard brittle one, is overstrained, there is less

damage done, for it may rip open in a spot that may be weak and the rest hold. A boiler, however, made of a hard material, when its integuity is once destroyed, will in all probability "go" and produce a disastrous explosion, just as a Prince Rupert drop, made of very brittle glass, will fly all to pieces when the tiniest part is broken off.

THE wild scheme for utilizing the water power of Niagara Falls in generating electricity, to be conducted to various cities and towns, which has been revived by Leonard Henkle of Rochester, has been effectually disposed of by Mr. Edison. Mr. Edison admits that it is scientifically possible, if a ten-horse power engine be placed at the Falls, to transmit a force of 9 9-10 horse power to New Orleans. But looking at the practical working the thing is an absurdity. To carry the electricity a long distance there must be large cables and such an expense that it wouldn't pay; it would be very much cheaper, he observes, to depend upon the local power of steam engines, and he puts the following case: Suppose for a given sum electricity could be carried fifty miles. You want to carry it 100 miles, but don't wish to double the expense of the plant. Then the intensity and pressure must be so increased that it would be impossible to work the machines on account of the danger, and the electricity could not be kept on the wires. He adds the following illustration, showing the absurdity of the scheme from a business point of view. "I could take water from above Albany and force it through an inch pipe to New York if the pipe would stand it, and if I had a pressure of say thirty miles high. Electricity can be carried theoretically at an enormous pressure, but practically it can't be kept on the wires, nor can the machines be handled. Just consider, too, the question of cost. This man says he will have 10,000 miles of cable. The Atlantic cable cost $1,500 a mile, and the wire in this cable is smaller than that in ordinary use. It is run, too, at a very low pressure. We use 20,000 times the pressure used in this cable. But on this exceedingly insufficient basis there is an item of $15,000,000 for cables alone."

THE decision of the Secretary of the Treasury on the question on appeal as to the amount of duty which should be imposed on car axles, is looked for with no ordinary interest. Manufacturers engaged in the making of iron and steel car axles declare that if the claim in this case of an importer of car axles is sustained we shall be flooded with sales of foreign make; seriously crippling the axle industry of this country, as it would take off $28 from the duty. It appears that J. M. Ross of Chicago, imported a lot of car axles, and claimed that under a decision at Boston some time ago the duty was only 1¼ cents a pound, instead of 2¼ cents as it has always been assessed heretofore. The collector refused to let the axles in at 1¼ cents and levied the full duty, on which the appeal comes to Secretary of Treasury. The importer claims that the iron car axle is an unfinished manufactured article, which the manufacturers deny. They say that an axle is certainly in one sense unfinished, because it has to be turned up to be fitted to the centre of the iron wheel by the car makers. For an axle, it is as complete as it ever can be until it is brought into contact with the wheel. Furthermore, the word axle is mentioned in the schedule under which the Treasury has always put this article before the Boston case and collected the duty.

THERE is little doubt that at no distant time the manufacture of iron rails will cease. The substitution of steel for iron rails is proceeding steadily over the country, and the supply even of old iron rails may be expected to terminate. Dealers in old iron rails last year, who found opportunity for accumulating large supplies owing to the extent to which the railroads were replacing their iron with steel rails, are blamed in many quarters for selling so freely, and "spoiling their subsequent trade," but results have proved the wisdom of their course. Already some of the Pennsylvania iron rail mills are changing their rail trains to merchant bar trains.

THERE is something startling even in this day of great enterprises that sane minds should have suggested a new waterway into Northern Africa, which will cut off Tripoli from Tunis and Algeria. To turn a great desert into a navigable sea is the feat which the French cabinet has just approved. It is to be effected by flooding the salt marshes and the lower portions of the desert of Sahara. The scheme, engineered by M. Lesseps, is too attractive and too promising of commercial results to be neglected. The N. Y. *Sun*, referring to the project, humorously remarks: "Men are beginning to take great liberties with the face of their planet, and these pending alterations may be only trifles compared with those to which they will one day subject the poor old globe."

THE account of the Nelsonville meeting of the Ohio Institute of Mining Engineers, published elsewhere in our columns, will be read with interest. The valuable papers submitted will appear *seriatim* in our journal. The Institute is now fairly started, and is certain to do good service to Ohio mining interests.

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised befor sendin to press.

OHIO INDUSTRIES.

THE Enterprise glass works at Ravenna have shut down.

THE Independent Rubber Stamp Co. has established itself at Niles.

AN additional pair of shears has been placed in the Grasshopper mill, Youngstown.

THE Shelby Wrench and Novelty Company has been incorporated with a capital of $10,000.

THE Rural Improvement Company of Toledo has been organized with a capital of $10,000.

THE Wheeling & Lake Erie Bridge Company has increased its capital $250,000 to $300,000.

A NEW flour mill will probably be built at Hudson, with a capacity of 125 barrels per day.

THE furnace at Buchtel is doing good work, casting from 45 to 50 tons of pig-iron daily.

THE spike works which it was proposed to establish at Bucyrus are to be set up at Columbus.

THE wheelbarrow department of the Ironton Hoe and Tool Company has just gone into operation.

THE Chemical Manufacturing Co. of Cleveland has been incorporated with a stock capital of $50,000.

THE iron workers' strike at Warren has ended by mutual concessions, and operations have been resumed.

YOUNGSTOWN iron manufacturers say they will positively shut down thir mills if the scale is advanced, unless prices also advance, as they could not run except at a loss and sell iron at the present rate.

THE Akron Iron Co. is putting up its 12-inch roll trains.

THE Fulton Gravity Scale Company of Cincinnati, has been incorporated with a capital of $30,000.

THE new spike factory being erected at the Mahoning Iron Works, Youngstown, will be ready for business in a few weeks.

A BRICK addition 100x35 feet to William Tod & Co.'s machine shop and foundry, Youngstown, is to be erected immediately.

THE Hamilton Works, Youngstown, are filling a contract for heavy machinery for the Edgar Thomson Steel Works of Pittsburgh.

IT is rumored that the Westlake Iron Co., of Warren, recently refused orders for 1,300 tons of iron, the price being considered too low.

THE Malleable Iron Works of Youngstown have collapsed. More than half of the capital stock of the company has been sunk, with nothing to show for it.

THE hours of work in the shops of the New York, Pennsylvania & Ohio, at Kent, have been reduced to nine per day. The men will only work five days per week.

THE Cleveland, Columbus, Cincinnati & Indianapolis shops in this city are to build this year 12 new Mogul freight engines, with 18x24-inch cylinders, for the road.

THE double puddling furnaces at the rolling mill of Andrews Bros. & Co., at Hazelton, are found to be a success. They are the invention of Mr. Swindell, a former resident of that city.

THE Youngstown Stove Works are producing between 500 and 600 cookstoves a month. All departments are on full time and no difficulty has been found in securing all the orders they can fill.

THE Dover Fire Brick Co., Canal Dover, besides making 10,000 bricks daily, are actively manufacturing gas retorts, together with stove backs and tiles. Their blast furnace lining has some of the best records in the States.

SUMMER BROS. & Co., Youngstown, expect to be turning out iron at their sheet mill in Struthers by the 1st of May. The machinery in the establishment will all be of the most approved kind and possessing the latest improvements.

THE Whitman & Barnes Manufacturing Co., of Akron, after doubling the capacity of their works, are again enlarging them. These additions will enable them to manufacture 1,500 complete knives and sickles per day at their works in that city alone.

THE Cleveland Steel Bow Socket Co. has been incorporated with a capital stock of $15,000. The company proposes to manufacture steel bow sockets, spring irons and other tools, its works to be located in this city. The incorporators are Messrs. J. B. Platt, W. J. Platt, Thomas Simmonds, R. T. Simmonds and Frank O. Spencer.

THE Standard Wheelbarrow Co., Portsmouth, has been incorporated with a capital stock of $25,000; also the Burke Drill Co., for the purchase, manufacture and sale of the Burke drill, has been incorporated, with headquarters at Cleveland; the capital stock is $10,000, in shares of $50 each. The incorporators are C. S. Barret, C. C. Nott, H. C. Burk, R. E. Mix and George C. Nott.

MESSRS. PALMER & DEMOOY, corner of Leonard and Merwin streets, have a building occupying 190 feet on Leonard and 100 feet on Merwin street. Gray iron castings, and everything from the fire-back of a grate to a wheel of a ton's weight are made. Mr. DeMooy has charge of the mechanical department of the establishment, and his sixteen years' experience as foreman for Taylor & Boggis makes it certain that first class work will be turned out.

THE citizens of Fostoria have under consideration a proposition for the erection of a railroad spike factory. The proposition is presented under the signatures of J. B. Barnes, Edmund Lincoln, J. K. Lape, W. T. W. Hall and Ed T. Keys, and proposes that for a donation of $10,000 and five acres of suitable land they will erect a factory under an incorporation to be known as the Fostoria Spike Co. The factory is to have a capacity of 40 tons daily and employ 100 men.

THE Cuyahoga Works have just shipped a large horizontal engine, 30 inches bore, 54 inches stroke, to the Akron Iron Co., Akron, O. The engine is extra strong and heavy, having a wrought iron shaft 16 inches diameter, and a fly wheel 21 feet diameter, weighing over 35 tons. The engine is to be used to drive two roll trains, squeezer, &c.

C. G. CONN, of Elkhart, Ind., will locate his Brass Band Instrument factory in Tiffin. The city is to furnish him ample buildings, and a 40 horse power engine and boiler. Within 90 days after the buildings are completed, Mr. Conn agrees to employ 100 hands. The buildings are to be made of a capacity sufficient to work double that number, should his rapidly increasing business require it.

THE foundation for the building in which will be manufactured cold polished shafting at the Valley Mill, Youngstown, is completed, and the erection of the building is in progress. New machinery furnished with the latest improvements, with an engine of 75-horse power, will be placed in the building. With everything running properly, the establishment will turn out 25 tons of shafting a day.

THE Tricycle Manufacturing Co., of Springfield, have made large additions to their factory and machinery, and are confident that they will be able to speedily execute all incoming orders. Among the various productions of this establishment the manufacturers desire to direct attention to their wheelbarrows, which they claim to be of superior strength, lightness and durability. The same advantages, besides good workmanship and pleasing appearance, are claimed for their tricycles and bicycles, which are in extensive use.

AS TO the strike, or rather lock-out, which occurred at the Cleveland Rolling Mills on the 9th inst., it is understood that the company did not object so much to the slight advance in price that the submitted scale contemplated as to the practical placing of their mills under the control of the Amalgamated Association of Iron Workers, as the men are said to have demanded. The company is rich, and not crowded with orders just now, and the burden of the strike will fall on the men. Of the 5,000 or 6,000 men in the Eighteenth ward who are thrown out of work by this movement, only about one-half are directly interested in the question at issue between the Amalgamated Association and the Rolling Mill Company. The rest are laborers, teamsters, helpers, and those whose labor depends upon that of the skilled workingmen.

MAINE.

PERRY & FLINT have leased for five years the brewery building at Cape Elizabeth, which they will fit up for the purpose of canning tomatoes, squash, pumpkins, etc. They have already contracted for the product of thirty acres of tomatoes and squash, and expect to can in all the product of fifty acres.

THE tannery at Mariaville, Hancock county, absorbs 2,500 cords of hemlock bark in the course of a season.

THE Hall Rubber Boot Co., Portland, has been organized with a capital of $30,000.

THE new Winslow Packing Co., Portland, has a capital of $500,000.

CONNECTICUT.

THE Bradley & Hubbard Manufacturing Co. at Meriden, who now have acres of brick factories, are about to add another building, to introduce brass rolling as a new department.

THE Yale Clock Co., New Haven, have orders for 1,000 pendulum clocks in bronze case, each from Tsin-Tsin and Hong Kong.

WM. F. ROCKWELL, of the Miller Bros.' Cutlery Co., Meriden, has been elected president of the National Pocket Cutlery Association.

THE Plume & Atwood Manufacturing Co. have added a pin manufactory to their brass works at Waterbury, and are turning out 200 cases of pins per month.

NEW YORK.

THE Buffalo Nut and Bolt Co. (limited), 226 Ohio street, Buffalo, manufacturers of hot pressed nuts, bolts, washers, rivets, etc., employ 45 hands The company was established in July, 1881, and ships all over the Union. They report a good trade, and have orders for three months ahead.

A COMPANY has been formed, with a large capital, to improve the water power at Mechanicville. They have already commenced the construction of a dam across the Hudson river at that point, to be built of Sandy Hill cut stone. The dam will be 1,000 feet long and 14 feet high. The company expects to expend within the present year in carrying out the mammoth enterprise more than $1,000,000. The first building to be put up this summer is designed for a paper mill, with a capacity of 15 tons per day; the next will be a pulp mill.

M. LOESER & SON, Buffalo, manufacturers of the "Empire Baling Press" are meeting with much success in the sale of that invention. It is coming into very general use with dealers in paper stock, who are discarding other presses for the "Empire."

PENNSYLVANIA.

THE citizens of Spring City have decided to organize the Spring City Iron Foundry, with a capital of $10,000, at $50 a share, to take the place of the Keeley Stove Works, which are to go to Columbia. A committee to solicit subscriptions is meeting with success, and in a few days all the stock will be taken.

MESSRS. BAIR & GAZZAM, practical machinists, 17 Wood street, Corner First avenue, Pittsburgh, make a specialty of gear and rack cutting, experimental work, and Rice's combination pump and heater Their tools are all new and of the latest improvement. The work entrusted to them is done on shortest notice. Messrs. Bair & Gazzam are practical men and give the business their personal attention.

Report of the Proceedings of The Ohio Institute of Mining Engineers.

NELSONVILLE MEETING.

Thursday, May 11.

[Specially reported for this Journal.]

The Ohio Institute of Mining Engineers met at Nelsonville, Athens county, Thursday, May 11th, pursuant to the call of the President. A number of the engineers from the northern and southern coal fields of the State, who arrived in the forenoon, organized themselves into a visiting party, and visited Brooks Mines, section 19, for the purpose of examining the coal cutting machines in use in those mines. In the absence of Mr. Brooks and the general manager of the mines, and Mr. Mitchell, the superintendent, being out surveying some mineral property in an adjoining township, the engineers were taken in tow by Mr. Wallace, who has charge of the mining machines. The engineers were treated to a ride through the mines in a mine locomotive, and went underground, drawn by the iron horse for upwards of a mile, and then proceeded on foot to examine the iron miners in operation. The Harrison machines are worked in these mines. A piston (about 2½ inches diameter, and 9 inch stroke,) which has a steel point or pick, flattened and sharpened like a miner's drill-point, inserted in the end of the piston, constitutes the cutter. The machine weighs about 800 pounds, and delivers, it was judged, about 300 blows per minute. After examining the iron miners, the visitors, in company with Mr. Wallace, inspected the mines, and were also shown an automatic pump—a recent invention of Mr. Wallace, who has applied for a patent on his invention. The pump discharges the water by compressed air, requires no attendance, and promises to be an important addition to the mechanics of mining.

The engineers examined with interest the tipple in use in this mine known as the "Mitchell Tipple," the invention of a working miner, and all agreed that it was the most ingeniously got up arrangement, and at the same time the most rapid and effective dumper they had ever seen. This tipple is so arranged that the cars dump themselves—an automatic arrangement. The track extends beyond the dump, and after the full car is unloaded the empty car stands in place till another loaded car advances and drives it forward out of the way. An ingenious spring, which is operated automatically by the loaded car passing over it keeps the curved rails or hooks in place which holds the cars on the tipple. After the car is unloaded the spring is acted upon by an advancing loaded car, and the hooks open out of the way while the empty car is pushed forward. For speed, economy and saving of the coal, this arrangement is very effectively constructed.

In the evening the regular session of the Institute was called in the parlors of the Dew House, Hon. Andrew Roy, State Inspector of Mines, in the chair. Mr. Roy read a telegram from Mr. R. S. Paul, of Summit county, Secretary of the Institute, stating that owing to sudden and very severe indisposition he could not be present. Mr. R. M. Hazeltine, of Youngstown, was elected secretary pro. tem.

Five papers were read at the meeting, one by Prof. Edward Orton, the State Geologist, on the formation of the lower coal measures of Ohio, one by J. G. Chamberlain, of Columbiana county, on the social condition of our mining population; one by Robert M. Hazeltine, of Youngstown, on the early development of the coals of Northern Ohio, and the practical duties of the mining engineer; one by Thomas Middleton, of Pomeroy, on mining legislation, and one by Andrew Roy, on the wants or areas of barren ground on the coal measures of Ohio. Prof. Orton's paper was the first one read. The learned Professor illustrated his paper with two large maps, one being a geological map of the United States, to aid in explaining the manner in which the coal strata were built up; the other map exhibited the areas of the coal fields of Europe and the United States by diagrams. Prof. Orton's paper was discussed by Mr. Jennings, Mr. Hazeltine, Mr. Head, Mr. Akley and Mr. Roy. The paper by Mr. Chamberlain, of Columbiana county, was read by the President. It discussed a subject with which all were familiar, but which, as the writer truly said, was one of the most important in connection with the economical production of our minerals. This paper elicited approving criticism, and will appear in full in the next number of the *Trade Review*. Prof. Orton, Mr. Jennings, Mr. Roy and others made remarks on this paper. The third paper by Mr. R. M. Hazeltine opened with an unusually interesting description of the development of the mineral resources of the Mahoning Valley, and discussed in detail the duties and practice of the mining engineer. Mr. Hazeltine's paper was listened to with wrapt attention, and contained valuable practical information to young engineers.

Mr. Thomas Middleton's paper on mining legislation in Europe and America was ably prepared, and abounded with facts and figures as to the valuable results obtained by government supervision of mines. This paper was discussed briefly by Prof. Orton, Mr. Roy and Mr. Hazeltine.

The last paper by Mr. Roy on the causes of wants or areas of barren ground in the coal beds of the State was the last of the series, and brought out quite a lengthy discussion by a number of the engineers. Mr. Akley, Mr. Head, Mr. Mitchell, and Mr. Hazeltine taking part in the discussion.

It was then agreed that the visiting engineers from distant parts of the State should pass all day of Friday in examining the mines and the mining machinery in the leading mines of the valley. The meeting then adjourned to meet the next evening in the Dew House on the return of the visiting engineers from the mines.

FRIDAY'S PROCEEDINGS.

The first mine visited on Friday morning was the Half Moon mines of the Akron Iron Co., situate at Buchtel, on Monday Creek. This mine, as are nearly all others in the Hocking Valley, is opened on Coal No. 6, generally known as the great vein coal. The engineers were taken in charge by Mr. Wm. N. Black, foreman of the mine. One attraction of this mine was the splendid ventilating furnace in use, which moves 26,000 cubic feet of air per minute along the main airways of the mine; the furnace is 8 feet wide, 4 feet high above the bars, 24 feet long, has a double arch, and rectangular chambers or air passages on each side, its whole construction being alike mechanical and substantial in character. The manner of laying out the workings of the mine is by working rooms 30 feet wide, leaving 10 feet ribs or pillars between rooms; two tracks are laid in each room; the pillars are taken out as soon as rooms are driven up their distance, which is usually 100 yards. The entries are all double in the mine The chutes were carefully examined and were found of recent and approved patterns, being modeled after the dump or tipple in use at Brooks mine, but were less complex and apparently did equally effective work. The manner of assorting the coal was well managed. On returning from the mines the engineers were taken in charge by Mr. Buchtel, the general manager of the Akron Iron Co., who showed them around the furnace and the new store of the company. This latter building elicited the admiration

of the visitors, not less by the magnificence of the structure than by the elaborate and practical division of the compartments. The engineers were put under obligations to Mr. Buchtel for his courtesy and hospitality. No visitors will be required to "put both hands on and lock themselves up" who may call on Mr. Buchtel. After dinner the engineers, in company with Mr. Buchtel, visited the mines of the Hocking Iron Co., at Orbiston, accompanied by Mr. Palmer, the mining boss. They found the mines in excellent condition as to ventilation, the roads good and dry, and they examined with interest a self-opening trop-dow which Mr. Palmer was trying to perfect. The furnace of this mine has two side chambers through which air escapes without passing over the fire. Mr. Palmer has found by experiment that these side chambers increase the current of air fully 2,000 cubic feet per minute, the maximum power of the furnace being 33,000 feet. This fact of the increase of current led to quite a discussion among the visiting engineers, Mr. Hazeltine taking the ground that there must be a mistake somewhere in the calculation, as the cool air by mixing with the hot air which passes over the furnace would decrease the temperature in the up-cast shaft and so lessen rather than add to the amount of current traversing the air galleries. Mr. Head believed the facts were as stated by Mr. Palmer; that side chambers invariably increased the current, while they at the same time lessened the consumption of coal in the furnace. It was finally agreed to discuss the question before a meeting of the mining engineers.

The next mines visited were the Longstreth mines, in which five Lechner mining machines were at work. The party was accompanied by Mr. Thomas Black, superintendent of the Akron Iron Co.'s mines, to whom the engineers are under obligations for this and other courtesies extended to them. The Lechner machine is quite differently constructed from the Harrison, the cutter consisting of a horizontal bar 3 feet long into which a number of knives are inserted. A groove 4 inches in height, 3 feet wide and 5 feet in depth is cut in the bottom of the coal. The weight of this machine is 1,500 lbs., and it seemed to impress the visitors more favorably than the Harrison, as it makes less waste and cuts faster. Both machines are ingeniously constructed. Mr. Thomas Berry, superintendent of the mines, and Mr. Henry Engles, mining boss, placed the party under obligations for kindness extended. The visitors were rather late in reaching the Longstreth mines, and regretted not having a better opportunity to examine the Lechner mining machines.

In the evening another meeting of the Institute was held in the Dew House to finish up the business of the session. A programme for a meeting to be held in Youngstown was again discussed, and that place was agreed upon for the next meeting, which will be made upon the call of the President, and be duly announced in the columns of the *Trade Review*. The session then adjourned, all the members being highly delighted with the results of the meeting. The Youngstown meeting, which will probably be held in October, promises to be an important one. Active men have the matter in charge who will spare no pains to make the meeting a grand success.

A WHITE NICKEL BRONZE.—A substance intended to supersede the nickeling of metals, is manufactured by the Societe Francais Anonyme du Nickel. The metal employed by the society contains 60 to 70 per cent. nickel, and is obtained by John Higginson & Co., in Numea, by roasting or melting garnierit, a mineral which is found in abundance in New Caledonia. At the works of the company in Marseilles, roasted garnierit is melted into bars, containing 99.5 per cent. nickel, and 0.25 per cent. of other metals. The proportion in which this nickel is mixed with copper, tin, and zinc, is according to the purpose for which the composition is wanted. To prevent its oxidation, the quantity of nickel should be at least 20 per cent. The price of the composition is about the same as that of copper or brass; as it is, however, much stronger, many objects manufactured with it can be made lighter, which makes it very suitable for mathematical, musical, and other instruments.

THE practical $5 Standard Electric Belt advertised in this paper should not be confounded with other electric goods.

MECHANICAL RECEIPTS AND ITEMS

To Clean Iron.

In order to remove rust and scales from iron plates, wire, and other iron and steel articles, Mr. A. Aorst places them without previous cleaning into a wrought or cast iron pot or retort on a fine sieve covered with powdered cast or pig iron. The retort is closed with a lid and heated, if the iron is covered with oxide or slag, to a white heat. After cooling the goods are found to be quite bright and clean. The gases evolved during the heating are absorbed by the powdered metal.

Welded Joints.

The following is the method for making welded joints at Halifax, England, a great centre for wrought iron boiler making: Plates of proper size and thickness are selected upon which the desired patterns are marked. Heavy punching and shearing machines are then used to bring the plates to the proper shape. They are then shaped by passing through bending rolls or between bending clamps according to the forms required. Such parts as admit of working cold are shaped without heating, but many of the forms require to be worked when red-hot. After the plates are thus brought to the proper shape, they are taken to the welding fires. The welders work in pairs, two men to each fire, and what principally characterizes their work is the rapidity with which it is performed. A second heat is the exception, and never the rule. All heavy work is handled by suitable cranes, operated by men specially trained in the requirements of the work. The welders have nothing to do but to make the seams, the matter to which they give their undivided attention. A high degree of skill, experience with the forms employed, and excellent facilities, seem to comprise the essential elements of success in this line.

To Silver Glass.

Make the following solutions: Solution 1—Nitrate of silver, 1 oz.; water, 10 oz. Solution 2—Caustic potash, 1 oz.; water, 10 oz. Solution 3—Glucose, ½ oz.; water, 10 oz. The above quantities are estimated for 250 square inches of surface. Add ammonia to solution No. 1 until the turbidity first produced is just cleared. Now add No. 2 solution and again ammonia to clear; then a little solution drop by drop until the appearance is decidedly turbid again. Then add No. 3 solution and apply to the clean surface. A film is obtained in 43 minutes at a temperature of 56 degrees Fahrenheit.

Welding Springs.

A correspondent of the Blacksmith and Wheelwright writes: My plan for welding springs is to upset to about the original thickness. Make a neat short scarf and weld the same as two pieces of common iron. Never split or punch holes. If, by accident, you should not get a good job, and some part is inclined to scale up and not weld thoroughly, take a small piece of rusty hoop-iron and insert under the scale and take a second heat. There is a good deal in having a good, clean, well-charred fire in work of this kind.

Steam Pipe Coverings.

Four parts of coal ashes, sifted through a riddle of four meshes to the inch, one part calcined plaster, one part flour, one part fire clay. Mix the ashes and fire-clay together to the thickness of thin mortar, in a mortar trough; mix the calcined plaster and flour together dry, and add to it the ashes and clay as you want to use it; put it on the pipes in two coats, according to the size of the pipes. For a six-inch pipe, put the first coat about 1¼ inch thick; the second coat should be about ½ inch thick. Afterwards finish with hard finish, same as applied to plastering in a room. It takes the above about two hours and a half to set on a hot pipe.

PETROLEUM FOR FURNACE FUEL.—Experiments with liquid fuel in steam boiler furnaces have been made in England with a boiler of 20 horse-power. The arrangement consists of a compound jet fixed through the sighthole of the furnace door. Steam is sent through one jet, which draws up and forces into the furnace, in the form of fine spray, a "special paraffin oil," while at the same time the air requisite for combustion is drawn in and highly heated in transit. No cold air enters at all; and even with dampers closed the combustion is perfect, and the temperature much intensified. The patentees apply their system to all purposes for which a great and pure heat is required.

Steam Boilers.

BY M. JOLIN LECKIE.

One pound of coal in a plain cylinder boiler should convert about six pounds of water into steam. Steam is a vapor that arises from water at a temperature of 212 deg. Fah. At that temperature it has the pressure of the atmosphere, 15 pounds to the square inch; an additional new temperature of 38 deg. will give it a pressure of two atmospheres, or thirty pounds to the square inch, and still another addition of 42 deg. will give it a pressure of four atmospheres. The reason why every additional degree of temperature raises the steam to a higher pressure proportionally than the one that preceded it, is that heat in generating the steam has to overcome the attraction or cohesion among the particles of water, and likewise the gravity of the water itself, and as the water becomes rarefied by heat, the attraction and gravity become diminished, and an additional temperature has not to contend with the same resistance as the one that preceded it. It will thus be seen how great a saving of fuel can be obtained by heating the feed water before it enters the boiler, providing it is heated by the exhaust steam. As the pressure of steam increases it is forced into less bulk; at the pressure of the atmosphere one cubic inch of water converted into steam will be one cubic foot, at the pressure of two atmospheres it will be one-half of a cubic foot, at a pressure of three atmospheres it will be one-third of a cubic foot, and so on in that proportion. In the same proportion that steam is pressed into less bulk the higher becomes its elastic force, and one cubic foot of steam pressed into half the bulk has double the elastic force. The higher the elastic force or pressure the more economical it is in working high pressure engines. To run an engine at 45 pounds pressure requires 15 pounds to overcome the back pressure caused by the atmosphere, leaving only 30 pounds for useful effect and to overcome the friction of the engine. This is a loss of one-third of the whole pressure, while to run an engine at 90 pounds pressure requires 15 pounds to overcome the back pressure caused by the atmosphere, leaving 75 pounds for useful effect. This is a loss of only one-sixth of the whole pressure. It will also take less fuel proportionally to maintain steam at a high pressure than at a low, that is it will not require double the fuel to maintain steam at 90 pounds than it will at 45 pounds, and as has been shown it will do more than double the amount of work.

When a boiler primes badly there is a great waste of fuel, and great injury done to the engine, as will be seen from the following: To stop a boiler from priming, there is a great reduction in the quantity of feed water necessary to produce the required volume of steam, or, in other words, an augmented boiler steaming power in proportion to the smaller quantity of water required to produce the steam. To this must be added the saving of the power absorbed in overcoming the resistance of water in the ends of the cylinder when working with wet steam. What is priming? is a question sometimes asked, and it appears not to be thoroughly understood. If a practical engineer is asked, dirty water is generally assigned as the reason; if a scientist is asked he will answer, that priming is ebullition caused by the action of heat on the body of water contained in the boiler. With this small degree of information we have had to be content, enduring at the same time all the evils attendant thereon. A fresh theory lately advanced holds that priming, although it is ebullition, is caused by friction on the outer surfaces of the steam globules as they pass up through the overlying body of water into the steam-chest; the amount of such friction being in ratio to the velocity at which the globules pass through the body of water, and that the friction is least when the water is pure, and greatest when it is dirty. The originator of the theory thinks we had mistaken the real effect or action of the old-fashioned plan of injecting melted tallow to stop priming. The reason assigned was that tallow spreads itself over the surface of the water and quiets it. When there is a pressure of steam in a boiler, any tallow injected into it immediately diffuses itself throughout the whole contents of the boiler, both water and steam. That this is the case can be proven by simply drawing a glass of water from any part or height of a boiler charged with tallow, or by condensing a portion of the steam; the taste or smell of tallow will be found in both cases. But tallow stops priming by lubricating the globules of steam as they pass through the overlying body of water, reducing the friction on their surfaces and, as a natural consequence they carry less water with them into the steam-chest. Tallow injected into a boiler combines with the mineral ingredients in the water and forms scale and substances which are non-conductors of heat that will soon destroy the boiler, and do more harm than good. The remedy for priming them is to use petroleum. It will stop priming, prevent corrosion, remove incrustations, and preserve the interior of the boiler and engine.

OHIO COAL MINES.

ADDRESS BY

R. S. PAUL,

BEFORE THE

Ohio Institute of Mining Engineers.

[Concluded.]

INSTRUMENTS.—For short sights, and where no great degree of accuracy is required, the best instrument for rapid work is a compass with open sights without telescope, with a good magnetic needle, and a divided circle by which angles can be taken independently of the needle, being what is often called a railroad compass. This instrument, mounted on a short tripod, with shifting plate, and perhaps a quick leveling attachment, is one that is very easily and rapidly handled, with but small chance of error in its manipulations, not easily getting out of adjustment, or being readily injured by accidents. But for longer sights, and for connecting the inside and outlines through a shaft or slope, the mining transit is preferable, and in many cases is a necessity for accurate work.

LAMPS.—The best lamps are of copper, though brass ones are good enough for most purposes. They should have a close fitting lid, with the air tube extending high enough, so that in stooping no oil will waste. The shield form of lamp is good for a hat or cap lamp, but the form known as the Scotch lamp is the one generally used. The surveyor should be provided with several good lamps, so that each of his assistants may have one. Plummet lamps, though very useful, are, I regret to say, but little used in this State.

OIL.—It is difficult to get a good lamp oil unless the mining engineer provides his own. He may rest assured that if he does not desire to ruin his eyesight or injure his lungs, he must not use the cotton seed or other vile oils in nearly universal use in our mines. Pure lard or sperm oil of the best quality bought of some reliable dealer should alone be used.

MEASURES.—In dry mines the steel tape divided in ten-foot spaces are the best measures, but in wet mines steel chains with foot links are the easiest handled, and least liable to mistakes in our mines. Where chains are used the fifty-foot is the best length.

The operation of running a line is about as follows: The instrument is set up. A lamp is carried ahead as far as it can conveniently be seen, or to some desired point, placed on the floor of the mine, a sight is taken to it, and the distance ascertained. A lamp is left as a back sight; the instrument is carried ahead, either set up over the flame of the lamp, or at the point where the flame was, and a back sight taken to the flame of the rear lamp. The instrument, if a compass, is deflected; if a transit, reversed; the deflection to the right or left noted, the needle let down, and the course read. The included angle is often taken, having less chance of error. In most cases no illumination of cross hairs is needed, they being plainly visible against the flame of the lamp which is sighted.

MARKING THE SURVEY POINTS.—This is done in several ways. 1st. By holes drilled or picked in the rock of the roof; 2nd. by marks pointed or chalked in the roof; 3rd. by nails or spikes driven in the over head timbers, from which a plum bob can be suspended; 4th. by pegs driven in the holes in the roof; 5th. by spikes or marked stones set in the floor; 6th. by the same kind of marks in the rib as in the roof, where, by reason of bad roof or bad floor, the foregoing methods cannot be employed, and which are witnesses to the point desired to be kept; and in very many cases all permament marks in the roof or floor should be witnessed by marks in the rib, and near these points should be plainly marked, if possible, the number or letter of the station.

In conclusion I would remark that there is a bright future before the mining engineer, and that from the miner, the superintendent, the mining engineer, with their allies the chemist, the geologist, and the metallurgist must come the solution of the problem how can we best carry out economical, and healthful, and safe working of coal mines, as far as appliances are concerned, and at the same time raise the status of the great army of workers who delve for the subterranean treasure, and on whom we are practically dependent for the supply of motor power and heat.

The address of Mr. Paul was listened to with profound attention, and a vote of thanks was unanimously passed by the Institute.

THE WORLD'S PRODUCTION OF PIG IRON.—M. Paul Trasenster, in an interesting article on the course of metallurgical industry, estimates the world's production of pig iron last year at 19,700,000 tons. In this total Great Britain figured for 8,500,000 tons; the United States for 4,205,000 tons; Germany for 2,900,000 tons; France for 1,894,000 tons, Belgium for 613,000 tons; and other countries for 1,500,000. The production of steel ingots last year is estimated by M. Trasenster at 5,708,000 tons. To this total Great Britain contributed 1,700,000 tons; the United States, 1,570,000 tons; Germany, 950,000 tons; France, 950,000 tons; Belgium, 138,000 tons; and other countries, 400,000 tons.

MINES AND MINING.

THE product of the Father de Linet Mine, Dakota, in the week ending May 1st, was 3,100 tons of gold ore.

THE bullion product of the Union mine, near Virginia city, Nevada, for April, was between $70,000 and $75,000.

THIRTY days' work at the Empire State mine, Silver City, Idaho, gives $23,822.18, during which time there was an average of about thirty miners employed.

THE annual product of the silver mines of South America at the present time is estimated at $11,000,000, and their total product to the present time amounts to $2,386,000,000.

THE Ingersoll mine, near Tombstone, Arizona, has shipped three bars of bullion weighing 6,125,20 ounces, valued at $7,165.52. Daily shipments are now being made.

THE new forty ton smelter of the Puna Copper Company, in Silver Bell district, Arizona, began work on the 21st ult., and since has yielded daily about 6,000 pounds of copper bullion and 750 pounds of matte.

THE Standard Consolidated Company, Cal., has, in one week, extracted and shipped to mills, 1,082 tons of ore; crude bullion received, 2,320 ozs.; amount of bullion shipped $17,707.86.

THE Indian Queen Mill and Mining Company paid their twenty-fourth dividend of five cents a share on the 19th ult., the product aggregating $6,250. Total of twenty-four dividends $337,500.

THE COPPER MINES OF MICHIGAN.—The April copper product, so far as reported, is as follows: Calumet & Hecla, 1832 tons, 245 pounds; Franklin, 153 pounds, 970 tons; Atlantic, 150 tons, 300 pounds; Allouez, 96 tons, 1030 pounds. Pewabic 51 tons, 110 pounds.

THE mill of the Santa Rita Copper and Iron Company, in the Black Range, New Mexico, is running steadily on copper ore from the mines, which it treats very successfully, the course copper running 95 per cent. fine. The company is confining its mining operations almost wholly to the Romero mine, which is sending out a large amount of high-grade copper ore.

THE yield of copper bullion from the Old Dominion Globe District, Arizona, to May 1, was 45,000 pounds.

THE annual bullion production of the different parts of the world is estimated as follows: North America, $101,-558,348; Africa, $8,993,800; Australia, $29,015,223; Europe (with Russia in Asia), $39,607,271; Japan, $5,382,948; South America, $8,531,761; total, $193,092,351.

A DISCOVERY of native copper and silver, twelve miles south of Laramie, Wyoming, has just been made. The ore cantains from 60 to 82 per cent. of copper, with gold and silver in paying quantity.

TOMBSTONE, Arizona, bullion shipments for Apr. Contention, $126,000; Girard, $34,764; Grand Central, $134,648; Vizina, $7,200, from 120 tons of ore; Ingersoll, $90,000.

THE Copper Queen, Dona Ana county, Arizona, has more than four hundred tons of ore in sight.

THE residents of Arizona continue to experience considerable trouble from the hostilities of the Apaches. The troubles, however, will probably be of short duration, as volunteers are organizing in various sections of the territory to assist the United States troops in subduing the Indians.

THE Borva copper mines, Arizona, improve as the developments progress. The work has been steadily carried on for eleven months, and the quantity of ore developed will supply the furnaces about to be erected. The foreman of Borva reports the mines in condition to take out 70 tons of ore per day. Assays average 23 per cent. copper.

THE Lake Superior iron ore shipments, from the opening of navigation to the 3rd inst., were for the Marquette Co. mines, 37,408 tons, and for the Menominee Range mines, 59,485 tons, making a total of 96,893 tons.

A NEW company has been engaged for some time in prospecting for coal on the farm of Jacob Stambaugh, southwest of Youngstown. Four holes have been drilled, in each of which coal has been found of fair thickness and excellent quality, the vein, it is believed, being the same which was operated by the Powers Coal Company for several years. As yet the basin has not been struck, and another hole will be drilled for the purpose, if possible, of running into the coal basin. The coal has been found at a depth of 140 feet.

THE recently published Census Monograph states that the deposits of Idaho bullion (so far as it is possible to segregate them, a very large portion having passed through private refineries, and thus losing their identity) up to the close of the fiscal year ending June 30, 1880, are $24,137,417 gold, $727,296 silver, and $24,864,713 total. This amount is less than the actual output to that date.

THE WORLD'S WORK.

We publish under this heading inventions and improvements of a business character; also accounts of various industries.

E. P. Roe's Small Fruits.

Mr. E. P. Roe is one of the best informed nursery growers in the United States. His establishment is at Cornwall-on-Hudson, New York. Much of his reputation is due to his judicious method of advertising, but were there not real merit to back up statements all such success would be ephemeral and short-lived. The influence of a business man like Mr. E. P. Roe can hardly be estimated in dollars and cents. He is a public benefactor. He teaches and instructs tillage, so that not only beauty, but value, may spring from it. Take, for instance, his work entitled "Success with Small Fruits." It is not only a superbly illustrated book, but certainly practical. It shows how easily acquired is the art of making money out of the soil by understanding how to do it, and when to do it; what to use, and how to use it. The book cannot help doing good. Mr. Roe says he has plants for the million, at prices to suit the million. He sends a catalogue free of charge to any part of the United States or Canada, and invites all interested to make application.

Everitt's Seed Potatoes.

Mr. J. A. Everitt, Watsontown, Pa., is known as the champion grower of variety potatoes in America. Farming has been reduced to a science in this country. Men like Mr. Everitt are required in several specialties. At present he is having a closing out sale, in any quantity from a single pound to a barrel. The following varieties are of his introduction: Luxury, Champion of America, Mammoth Pearl, English Variety and White Whipple. Then in stock are the Magnum Bonum, White Rose, Belle, White Elephant, St. Patrick, Burbourk and Early Rose. Any of these varieties, if sent to the purchaser in pound lots, are prepaid; but if in larger lots, whether remitted by freight or by express, are at purchaser's expense. Mr. Everitt's experience in the growth of potatoes renders him high authority on the nature of soil required, the treatment, and the best variety for any certain soil. There is as much brains required in raising a first-class potato as there is in raising a first-class roadster; but it took farm owners a long time to find it out. Mr. Everitt is one of the ablest of their assistants, and has done much to spread a knowledge of this important branch of the farming industry. He has issued a valuable catalogue of 54 pages, which is sent free by mail. The present spring has been so backward that he has prepared a special list of the varieties that are not yet too late for planting, and will be certain to produce fully. It will pay to address him at Watsontown, Pa.

A SUCCESSFUL CLEVELAND HOUSE.—In the Spring of 1876 Mr. E. F. Ensign, of Lake County, Ohio, came to this city as a general merchandise broker. It was not his original intention to carry stock, but as his trade increased rapidly he found it necessary to do so. In all cases when it was practicable he purchased direct of the manufacturer, which enabled him to place his goods upon the market at jobbing prices. He has made a specialty of agricultural implements, and it is in this line especially that his business has developed. He controls Ohio on some of the most popular implements now manufactured, notably the Empire Grain and Fertilizer Drill, and the Ross-Cummings Ensilage Cutters. Some idea of his business in the implement department may be gathered from the fact that he has received ten car loads besides numerous invoices for his Spring trade. In looking over his stock we were especially impressed with the "Hubbard Gleaner and Binder," which is evidently a very important step forward in labor-saving machinery. It will bind the grain successfully after any side-rake reaper, or even from a cradled swath. As it is easily operated by a single horse and does not require an expert to handle it, it must find a large sale as a companion machine for the thousands of side-rakes now in the hands of farmers. Among the more important implements which Mr. Ensign handles are the Minneapolis and McCormick twine binding harvesters, McCormick mowers, Perry Royce reapers, Malta and Fremont sulky cultivators, Albion sulky harrow and Chieftan sulky rake. Mr. Ensign is located at 134 St. Clair street, Cleveland.

TO REMOVE RUST AND SCALES FROM IRON AND STEEL ARTICLES.—Place them without previous cleaning into a wrought or cast iron pot or retort on a fine sieve covered with powdered cast or pig iron. The retort is closed with a lid and heated, if the iron is covered with oxide or slag, to a white heat. After cooling the goods are found to be quite bright and clean. The gases evolved during heating are absorbed by the powdered metal.

PRACTICAL MECHANICS.

Malleable Cast Iron and the Annealing of Steel.

BY M. FORQUIGNON.

Since the time of Reaumur, who, in his classic memoir of 1722, first formulated the principles of the operation, the manufacture of malleable iron has become of great importance, but, in spite of the improvements introduced in its production, the chemical history of this product has still to be written. Up to the present all that has been known is that malleable iron is cast iron deprived by oxidation of a part of its carbon, and thus approaching the state of steel or wrought iron. To fully understand the experiments, attention is drawn to the following points: 1st. All pig iron is not equally adapted for the process. Grey or manganiferous pig give bad results. White pig made from the purest ores is preferable. 2nd. The softening of the iron applies nearly exclusively to small objects; the operation does not succeed well in the case of objects more than an inch in diameter. 3rd. The time for baking varies, according to size and quality required, for twenty-four hours to six days or more. 4th. The temperature of the furnaces is generally bright cherry red. 5th. Peroxyde of iron (powdered red hæmatite) is almost the only substance now used as cement. The object of the author has been to determine the chemical composition and the tensile strength of numerous samples of malleable cast iron differing from one another either in composition, in place of manufacture, or in the treatment they had undergone, the effects of different substances used as cement, and also to find out in what way malleable iron differs from steel, wrought iron, and cast iron. In order to attain the objects in view, the author conducted a series of analyses of cast iron before and after its transformation, and experimented as to its physical properties, especially its elasticity. The first series of experiments were made with cast iron heated in contact with powdered hœmatite. Secondly, heated with various substances, such as charcoal, iron filings, silica, quicklime, calcined bones in powder, colcothar, and marine salt. Thirdly, in contact with various gases, such as hydrogen and nitrogen. These experiments proved that the softening of the cast iron does not result from the oxidation of its carbon, but that this oxidation, when it does take place, is purely accessory. By the simple action of a temperature sufficiently high, but inferior to its melting point, the white cast iron is destroyed or becomes carbonized, so to speak. A veritable amorphous graphite belonging to a particular variety is deposited abundantly through the whole mass of the bar, sometimes in the form of little visible agglomerations, sometimes disseminated or intimately mixed. Instead of combination, there is now only a mixture of free carbon and free iron. The cast iron, deprived of a part of its combined carbon, is softened, and its resisting properties are greatly modified. The action ends here if the heating takes place in an inert substance like charcoal, but if the iron is in contact with a substance capable of burning or absorbing the carbon, a secondary reaction takes place, the free carbon on the surface is burnt, a portion of the graphite from below comes to the surface and in its turn is destroyed. Manganese in the iron prevents softening by opposing the formation of graphite. The author sums up as follows: 1st. A cast iron really malleable always contains amorphous graphite. 2nd. A cast iron may lose carbon and still remain brittle if graphite has not been formed, or if the existing quantity of graphite is not increased. 3d. A cast iron can become malleable without losing a sensible portion of its total carbon. 4th. If silicon is added to a manganiferous cast iron, the latter is improved by the reheating. 5th. Hydrogen and nitrogen combine with the carbon in the cast iron, which in this case alone can become malleable without the production of graphite. 6th. The breaking weight is always more than doubled, sometimes more than quadrupled, by the reheating; it increases with the length of the heating very rapidly at first, very slowly afterwards. Finally, malleable iron occupies a place intermediary between steel and grey pig; it differs from the latter by the special nature of its amorphous graphite, and by its great tenacity, and from the former by its large quantity of graphite. A series of experiments with steel similar to those with cast iron, viz., reheating in contact with various substances, confirms the above conclusions.

[We would remark that it would be a great advantage to a large number of manufacturers if a small and suitable furnace were brought out for annealing steel, in which, for this purpose, a very high temperature could be easily attained.—ED.]

Dissolving Soft Solder.

Generally speaking, old work, which has to be repaired, regilt or colored, contains soft solder, the result of being mended by inexperienced persons. All this must be removed or destroyed before the articles can be properly repaired. It is a general belief among workmen that annealing and boiling out will destroy it, but it really has a contrary effect, the heat thus given tending only the more closely to amalgamate the solder with the gold. We have often tried to remove the solder after the annealing process by scraping and filing, and have always found that it had penetrated so deep into the gold that it would be utterly impossible to eradicate it by any such means. One of the common methods of treating this class of solder in the workshop is to remove whatever you can by means of the scraper (which consists of a three-square file sharpened at the point), and then to place tha article in tolerably strong muriatic acid for some time. Nitric acid is a much quicker way, but it cannot be safely applied to articles of inferior qualities of gold, as the acid would act upon the alloy of which they are partly composed; but for colored gold it may be used with advantage and safety. From a long practical experience in the matter of soft solder, we have arrived at the conclusion that there is no better way of treating it than that which we are about to point out. The solvent employed is a mixture of muriatic acid and crocus (jewelers' polishing material), and prepared as follows: To 8 ounces of muriatic acid add 1 ounce of crocus, and shake it well, in order that it may become perfectly mixed; of this mixture take 1 ounce, and add to it 4 ounces of hot water; place it in a pipkin, and keep up the heat by means of a gas-jet; put the articles containing the soft solder into it, and soon the desired result will be achieved.

Flat Wire Ropes.

BY A GARCENOT.

The substitution of wire for hemp ropes in winding shafts is attributable to the increased depth of the pits, and to the inadequacy of the machinery for winding with hemp ropes. As the breaking strength of best round hemp ropes ranges between 5 and 6¼ tons per square inch of net section, while best round iron-wire ropes are from six to seven times as strong, and about six times as heavy for the same net section, it follows that round ropes of equal strength are also of nearly equal weight per yard, whether made of hemp or of iron wire. That wire ropes for winding are sometimes made as much as 1,200 yards long, though ranging mostly between 400 and 800 yards long. By way of taper, the full sectional area is generally retained throughout half the length of the shorter ropes, and is succeeded by a smaller section in the remaining half; while in ropes of 600 yards and upwards three sizes are employed, each for 200 yards length and upwards:—the big end has eight to ten wires in each strand, the middle length one less, and the small end six to eight. The iron wire ranges from 0.071 inch to 0.118 inch thick), the usual thickness being 0.087 inch. In ropes of steel or phosphor-bronze the wires are 0.071 to 0.087 inch, and in small steel ropes even 0.059 inch.

As a fair example, a flat iron-wire rope of 700 yards length, suitable for winding from about 500 yards depth, is ordinarily composed of six hawsers, stitched together alongside; each hawser consists of four strands, which are laid with left-handed twist in three of the hawsers and right-handed in the alternate three; each strand commences with ten wires at the big end of the rope, and, omitting one by one, terminates with six wires at the small end; the wires are 0.087 inch thick, and are laid spirally without a twist around a core or heart consisting of a small strand of tarred or greased hemp. The stitching of the hawsers together is done by sewing them through by hand, in a zigzag direction, at 2⅜ inches pitch, with 15 wires of No. 14 gauge; these wires are either laid singly side by side, as a thin flat band of 1.3 inch width, or are twisted together in threes, forming a narrower but thicker band of five round strands. The latter, or round stitching, is quicker though harder for the workman to do, and does not bind the two outside hawsers nearly tight enough to the inner ones. With the flat stitching, though always done much tighter than the round, the tightness of the several wires is often unequal; which interferes with the uniform stretching of the hawsers under the load in regular working, and is one of the principal reasons why flat ropes twist when hanging down the pit. The tighter flat stitching also materially increases the stiffness of the ropes, in comparison with the round stitching. Tables are given of the widths and thicknesses of the rope with the two kinds of stitching, at its big end, middle, and small end. The weight of the small rope averaging about 14 lbs. per yard, the gross load upon it at the winding drum amounts to 8 or 9 tons, on starting without weight to wind from 500 yards depth, a loaded cage weighing 5 to 6 tons. The strain would thus be only about 7 tons per square inch of wire section. But in pits where the average speed of the cage is from 20 to 23 feet per second, (14 to 16 miles an hour), the rope is often running at 26 to 30 feet per second (18 to 20 miles an hour) by the time all its slack has been taken up. It then starts the cage with a jerk, which brings the strain at the drum up to about 13½ tons per square inch, and stretches the rope nearly 1½ yard in the 450 yards depth. A rope exposed to such a jerk would work with perfect safety. The splicings of the wires almost always occur within the middle of 200 yards of a rope 750 yards long. Testing proves that the loss of strength due to the splicings is about 10 per cent.; whence the desirability of using wires long enough to do without splicing, and so to allow of making the rope nearly 10 per cent. lighter for the same strength. The pressures produced latterly upon the different kinds of cross-stitching by the bending of the flat rope in its passage over a pit-head pulley of ten feet diameter are smallest in the case of a single thickness or layer or flat stitching, and greatest with a double layer of round stitching. In winding upon the rope roll, each successive coil has to slip sideways, right and left alternately, so that its component hawsers may lie in the furrows between those of the next coil beneath. The strain thereby thrown on the cross-stitching is independent of the diameter of the component hawsers sewn together into the flat rope, and is directly proportional to the strain on each of them; whence a large number of smaller hawsers in a flat rope is preferable to a smaller number of larger ones, as regards the durability of the stitching—a conclusion confirmed by experience.

TRIUMPHS AT ATLANTA.

The Monarch Traction Engine—Hooven, Owens, Rentschler & Co., Hamilton, O.

It remained for this firm to demonstrate that a traction engine requiring but little mechanical skill could be built and become popular. One house in Pittsburgh, Pa., one in Philadelphia, one in New York and one in Boston, made bad failures. The reason is obvious: Not one establishment put up a practical engine. They were too complicated, weighed too much, were constantly getting out of order, and did not pay a simple interest on the investment. The Monarch Traction Engine is built in a complete manner, out of select material, is light in running, and has been given complete tests in every way. It is made in three sizes, ten, twelve and sixteen horse power. In speaking of it, the company says it "combines the essential features necessary to make a complete self-propelling engine. Its capacity in pulling is from ten to fifty thousand pounds on ordinary roads. The tires are from eight to twelve inches wide, preventing the engine from miring in mud or sand." The 1882 improvement is a link motion by which an instantaneous forward or back movement is made. It also has a new patent dome, and a new arrangement for coupling engine to traction gear. These engines must become popular as they become known, and the manufacturers are taking the proper method of telling the public of their virtues. It took first prize at St. Louis and at Atlanta in 1881.

The Hagerstown Steam Engine and Machine Co., Hagerstown, Md.

This well-known manufacturing company carried off the first award at Atlanta for a threshing machine. It was declared one of the best on exhibition, and its record was proven superior to very many makers who continue to blast in the public press. They make a line of agricultural machinery, which is found everywhere. Their "Empire" Portable Engines, Grain and Seed Drill with fertilizing attachment, and the Hagerstown Clover Seed Huller and Cleaner, are standard. The Drill is noted for its accuracy in sowing seed, and measuring the number of acres at the same time. The flow of grain is even and continuous; no gaps are left, nor any clumps sowed, a failure with most drills; the seeding is more regular and accurate than by experienced hand. It is light in draft. The fertilizer will sow any kind of manure, dry or damp. The Hagerstown Clover Seed Huller is not only a novelty, but a very successful one. It is built with two hulling cylinders, takes the hay from the field and deposits the chaff from the rear end of the machine, and the seed in a bushel or bag at the bottom. Its capacity is from twenty to sixty bushels per day. This is one of the most popular machines. The company also builds corn shellers, stationary engines and boilers of all sizes, and does general machine work. The exhibit at Atlanta was greatly admired. Many had no idea of such improvements in the farming line.

TO OBTAIN A PLASTIC MASS.—J. Lohze, of Gruns, near Dresden (German patent), secures this by well mixing, in equal proportions, ground, calcined, and paste magnesite and a solution of sulphate of magnesia of 1,900 specific gravity, and running this mixture into oiled molds. The mass can be washed with warm water and soap when it is hardened. The mass, which is called "marmorin," is said to have the appearance of white marble, the hardness of which it acquires with time. The same molds can be used with this mass which are used for casting gypsum.

MISCELLANEOUS RECEIPTS.

TO PRODUCE SHADES IN GOLD LEAF.—To produce light and dark shades of gold leaf the metal is alloyed with silver and copper. The addition of the baser metals lessens the malleability, and as the leaf is sold by superficial measure and not by weight, adulteration is kept at the minimum.

TO MAKE A FINE BLACK INK.—Take well bruised Aleppo galls 4 ounces, clear soft water 1 quart; macerate in a clean corked bottle for ten days, with frequent shaking. Then add 1¼ ounces of gum arabic (dissolved in a cup of water), ½ ounce of lump sugar; Mix well, and afterwards add 1½ ounces of sulphate of iron, powdered; shake it frequently for two or three days, then set it away and let it stand for a week. This ink is pale at first using, but turns intensely black.

TO MAKE INDIA RUBBER VARNISH.—Inclose 30 grams of finely cut caoutchouc in a capacious linen bag, and suspend this within a flask containing a litre of benzine, by means of a thread held fast by the stopper, so that the bag remains near the surface of the liquid. In the course of 9 or 8 days the soluble portion of the caoutchouc—about 40 to 60 per cent.—will pass into the benzine, while the contents of the bag will expand enormously. The clear solution, which is quite viscous, and contains 1.2 to 1.5 per cent. of caoutchouc, is then carefully separated. The swelled contents of the bag retain ¼ to ⅓ of the benzine used, and may be utilized for the preparation of an inferior kind of varnish. A solution of India rubber in benzine kept in half-full bottle, is decomposed on exposure to light, which may be seen by the change in the solution from a viscous to a thin fluid condition. Even in the dark this change goes on, but it takes about three times as long.

TO DISSOLVE GOLD FOR GILDING.—To dissolve gold for gilding china or glass that has to be burnt, triturate gold leaf in a mortar with a little honey until reduced very fine; then dissolve out the honey with hot water, and mix the gold with a little gum water for use; or dissolve the gold in hot aqua regia, evaporate to dryness in a porcelain dish over a hot water bath, and dissolve in ether for use.

REMOVAL OF INK STAINS.—An article in the Journal de Pharmacie d'Anvers recommends for the removal of ink stains the use of the pyrophosphate of sodium, which does not destroy cellulose, and yields colorless compounds with ferric oxide. Before treating the spot with this salt it is recommended that a few drops of tallow should be allowed to fall from a candle upon the spot, which should then be washed in a solution of the pyrophosphate until tallow and ink spot have disappeared. If necessary the operation may be repeated.

TO CLEAN SILVER.—The simplest and cleanest substance for cleaning silver articles is, according to Prof. Davenport, hyposulphate of soda. It acts quickly, and is inexpensive. A rag or brush, moistened with a saturated solution of the salt, cleanses even strongly oxidized silver surfaces in a few seconds, without the application of any polishing powder.

TO COPY DRAWINGS, MAPS, ETC.—M. Joltrain employs the following process for copying drawings, maps, etc., in black lines on a white ground. The paper is immersed in the following solution: Gum, 25 ozs.; chloride of sodium, 3 ozs.; perchloride of iron (45 B.), 10 ozs.; sulphate of iron, 5 ozs.; tartaric acid, 4 ozs.; water, 47 ozs. The developing bath is a solution of red or yellow prussiate of potash, either neutral, alkaline or acid. After being exposed, the positive is dipped in this bath, and the parts which did not receive the light take a dark green color; the other parts do not change. It is then washed with water, in order to wash away the excess of prussiate, and dipped in an acid bath containing either acetic, hydrochloric or sulphuric acid, when all the substances which could affect the whiteness of the paper are removed. The lines have now an indigo black color. Wash in water, then dry.

TO DYE PARCHMENT.—Parchment can be dyed green, blue or red. To dye it blue, use the following process: Dissolve verdigris in vinegar; heat the solution, and apply it by means of a brush on the parchment, till it takes a nice green color. The blue color is then obtained by applying on the parchment thus prepared a solution of carbonate of potash. Use 2 ounces for 1 gallon of water. Another method is to cover it by means of a brush with aquafortis, in which copper-dust has been dissolved. The potash solution is then applied as before, till the required shade is obtained. Another method is by using the following solution: Indigo 5 ozs., white wood 10 ozs., alum 1 oz., water 50 ozs. Red: The parchment is dyed red by applying with a brush a cold logwood solution, and then using a 3 per cent. potash solution.

"BLUE GRASS ROUTE OF OHIO."—The Cleveland, Akron and Columbus Railroad.

FACTS
For Machinists, Manufacturers and Others.

FIRES FFOM STEAM-HEATING PIPES.—Steam-pipes cause fires in two ways: first, by assisting spontaneous combustion of oily fibre, and secondly, by very slow carbonization of wood at a low temperature which will ignite at a slightly higher temperature. It is a well-known fact in chemistry that the temperature at which charcoal will take fire varies with the temperature at which it is made. The extremely low temperature at which some forms of carbon will ignite is shown by the familiar experiment of burning tinder in a close glass tube fitted with a piston; the heat developed by the condensed air, when the piston is forced down, being sufficient to ignite the tinder. The writer has seen charcoal ignited by the heat of a horizontal flue which was cool enough to serve for a walk Steam pipes must be kept clear of combustible material of all kinds and nature. In passing through hollow walls and floors, the pipe should be surrounded by a sleeve made of larger pipe—large enough to leave a free air space between the steam pipe and outer pipe. Rats are prone to make their nests around steam pipes in such concealed spaces. The necessity for all excessive espionage can be saved, available area added to the mill, and all portions of the mill containing machinery can be more uniformly and economically warmed by elevating the steam pipes, running them around the rooms about two feet from the walls and ceiling, the lines of pipe lying side by side, in a horizontal plane. The use of elevated steam heating pipes in rooms without operating machinery has not been sufficiently general to warrant any decided opinion in the matter.

ELECTRICITY IN PORCELAIN FACTORIES.—Electricity is now used in porcelain factories to obtain a perfectly white paste. Magnets had been experimented with to this end, but it is only within a short period that Messrs. Delavergne of France have obtained satisfactory results. The pastes, in a liquid state, are run before very powerful electro-magnets driven by a Gramme machine. The poles of the two electro-magnets are placed opposite each othes, and between each of these magnetic groups is a kind of funnel, the poles of which act on the mold in which the liquid runs. Twice a day the surface is cleaned of ferruginous particles that adhere to it Upwards of 2,000 pounds of paste can be purified daily by this process, which gives the manufactures an additional value of forty per cent.

CLASSIFICATION OF STEEL PLATES OR BARS.—Belgian steel, by a recent decision of the Societe Cokerill, has been arranged as follows: Very low or extra mild steel—carbon .05 of one per cent. to 20 of one per cent.; tensile strength from 50,000 to 34,000 pounds per square inch; elongation 20 to 27 per cent. in eight inches of length. This class of steel welds, but does not temper, and is used for boiler plates, ship girders, spikes, wire, etc. Low or mild steel—carbon 20 to 35 of one per cent.; tensile strength from 64,000 to 76,000 pounds per square inch; elongation 15 to 20 per cent.; can be welded only with difficulty, and hardens very little; used for railway axles, guns, rolls, locomotive tires, and other pieces exposed to heavy strains. Medium high steel or hard steel—carbon 35 to 50 of one per cent.; tensile strength 76,000 to 92,000 pounds per square inch; elongation 15 to 20 per cent.; does not weld, but may be tempered; used for rails, special tires, springs, spindles, hammers, guide bars or pistons of steam engines, pieces subject to friction, heavy pressure, crushing strains, etc. Extra hard or very high steel—carbon 50 to 65 of one per cent.; tensile strength from 92,000 to 102,000 pounds per square inch; elongation 5 to 10 per cent.; does not weld, but is susceptible of a very high temper and finish; used for delicate cutting instruments, fine springs, files, saws and metal cutting tools. Reference to this will be found serviceable to mechanics and manufacturers.

SOLUBLE GLASS.—Soluble glass has not yet found all the applications for which it may be used. Mixed with lime it forms, when dry, a compact stone, similar to marble. An analogous product is obtained when it is mixed with bone ashes, zinc white and magnesia. Ransome's artificial stone is prepared by mixing sand with soluble glass so as to obtain a compact mass, which is pressed into moulds and then put into a solution of chloride of calcium. Silicate of lime is thus formed, which acts as a cement, whilst the chloride of sodium which forms is eliminated by washing in water. Together with clay, lime, sand, cement, etc., soluble glass finds application in the manufacture of tiles, slates, decorative stones, etc. It is also used in the manufacture of common soap.

SCIENCE AND INVENTION.

PENETRATION OF LIGHT IN WATER.—It has been thought, as a result of Prof. Forel's experiments with the albuminized paper of photographers, that light cannot penetrate water to a greater depth that about 125 feet. M. Aspes has, however, found recently by exposing more sensitive plates that light penetrates clear water at least 300 feet; while it is possible that rays so feeble as to escape detection by any means now at command, yet powerful enough to exert an influence upon some forms of sub-aqueous life, may reach still greater depths.

PURE CARBONS FOR ELECTRIC LIGHTS.—The method adopted or recommended by M. Jaquelain for making pure carbons suitable for steady electric lighting is as follows: A current of dry chlorine is passed for thirty hours on several kilogrammes of crayons of retort-carbon heated to a bright red, and afterwards letting carburet of hydrogen circulate among the carbons for five or six hours. He has other methods for preparing the carbons, but this seems to be the best.

DEPOSITION OF METALS.—An improvement in depositing metals by the action of acid in an economical manner and without the aid of electricity, as usually applied in electro-bronzing, has been invented by Messrs. Maltby & Bradford, of Rotherham. The invention consists in immersing the article upon which the metal is to be deposited, for a period of time varying according to the thickness of the deposit required, in a vessel containing a solution of aquafortis (or other suitable acid) and water, in which is also placed and immersed a sufficient quantity (in plates or other suitable form) of the class of metal which is desired to be deposited.

ROTARY FILES.—A Connecticut mechanic has made a trial of rotary files for finishing planed surfaces. He is of the opinion that quicker and truer work can be done with these than with hand files, and that the surface is in better shape for trueing with the scraper. His experiments have been confined to the planes; but he believes that his device may be properly and economically adapted to the lathe and milling machine.

COMBUSTIBILITY OF IRON.—The combustibility of iron has been demonstrated by Prof. Magnus, and is susceptible of proof in the following manner: The pole of a good sized magnet is approached to a mass of iron filings, a bunch of which readily attaches itself thereto. In this condition, being a large quantity of air mechanically entangled in the loosely aggregated mass, the iron is in so favorable a condition for combustion that the approach an ordinary spirit lamp is sufficient to inflame it —in fact, it burns readily and continuously, like any ordinary combustible.

IMPROVED HOISTING MACHINERY.—The Chicago *American Engineer* illustrates in its last issue a new plant of hoisting machinery lately erected and now satisfactorily at work at the main mine of the largest mining company in the Lake Superior iron district, the Lake Superior Iron Company, Ishpeming, Mich. It consists of four drums 12 feet in diameter and five feet face with a capacity for 1,700 feet of 1¼-inch wire rope each. The drum shells are of cast iron, cast in halves for convenience in transportation. They have a spiral groove for the rope. The driving gears are 14½ feet diameter, 4-inch pitch, with 10-inch face, and the pinions on engine shaft are 4½ feet diameter. The brake band is applied to the drum itself, so that in case of accident to the driving gear the drum still remains wholly under the control of the brakeman. These drums are of twenty tons weight each, yet are so nicely balanced that not only do they work smoothly, but the weight of the skip or iron car in which the ore is hoisted is sufficient to take them back easily and promptly. The pinions are loose on the engine shaft, and have a very long hub and a taper brass bushing to guard against wear, there is a ring five feet diameter and 8 inches face bolted to the side of each pinion and fitted with a driving band by which the power of the engines may be brought to bear at will to drive the drum.

ITEMS OF INTEREST.

Krupp, the German gun maker, has engaged 8,000 more workmen.

A new departure in the use of glass has recently been made in Pittsburgh, a patent having been granted for the manufacture of glass shingles.

The total production of zinc in Europe in 1880 was 202,330 tons. Germany produced 99,405 tons; Belgium, 65,000; England 22,000; France 13,715, and Austro-Hungary, 3,200.

The great lake system, including the United States and Canada, now has 2,498 sail vessels, 1,398 steam vessels, 630 canal boats and 162 barges; total, 4,498 crafts, of 803,370 tons.

It is said that the dynamite manufactories now under the control of M. Noble (the man who introduced nitro-glycerine in its varied forms into public use), turn out about 5,000 tons a year.

The wheat crop of Arkansas this season is the best for ten years. In many localities it is already harvested, and the yield is pronounced excellent, in some counties averaging twenty bushels per acre.

The first counting of the French census returns shows that the population of France has only increased 389,670 since 1876, and that the present population is 35,597,000 which is almost exactly the population of the United Kingdom.

The amount of jute bagging consumed in this country is enormous. The farmers of California alone use in one year jute bags to the value of $2,450,000. Over $4,000,000 worth of jute stuff is used annually to hold the cotton crop of the United States.

England sent $18,000,000 worth of merchandise to Japan last year and imported from the same country $3,400,000. The United States sent $1,742,000 and took away $12,388,000. It is prophesied that in twenty years Japan herself will have a larger merchant marine than the United States.

It has been proposed in Germany to dredge the Rhine, so that Cologne may become a sea port. The proposition has been received with much favor, but with some apprehension on the part of Holland and the Netherlands, lest it bring serious injury to the ports of Antwerp and Rotterdam.

At a recent scientific meeting in San Francisco a paper was red on the substance known to miners as "hell-fire rock." When striking their picks into this formation flashes of light are seen, which they regard with superstitious alarm. A chemical examination shows this mineral to be an impure dolomite.

Iron (London) says: There are many articles in which several countries are a long way ahead of us. An example is to be found in the superiority of the tools which are now so largely imported into this country from America and which, while remarkable for their quality and finish, are much less costly than those of English production.

A company in Paris is trying the distribution of power for small workshops, and for household purposes, by means of vacuum. It has already constructed the service for about 700 yards, and is providing with power several small workshops. A powerful engine with air pumps makes a vacuum of about three-quarters of an atmosphere, with which the motors are connected.

At the recent anniversary of the St. George Society, at New York, the British consul, Mr. Archibald, spoke of the large and increasing commerce which bound the United States and England to each other, England taking 60 per cent. of the products and manufactures we exported, and having 8,500,000 tons of her shipping trading at our ports during the last fiscal year.

Pile Driving by Electricity.—The latest instance of the application of electricity to mechanical purposes is that of pile driving. At Hatfield Park, England, the piles to support a coffer dam across the river Lea have just been successfully driven by the power of a water-wheel situated at a distance, which power was transmitted by two dynamo machines to the gearing connected with the pile driver, of ordinary construction, erected on a barge floating in the river. The machinery worked well, lifting a monkey weighing about 400 weight with ease and regularity.

Preservation of Iron.—Although the processes for the preservation of iron by Professor Barff and Mr. George Bower lead to the same end, there is a difference between them in practice and results. In the Barff process the iron and steel articles are subjected at a red heat to the action of superheated steam, when the latter becomes decomposed. The oxygen, combining with the iron, forms magnetic oxide—the only oxide of iron which is not affected by atmospheric conditions. The Bower process consists in submitting the metals at a red heat to the action of ordinary air, and also of carbonic acid gas, produced from the combustion of carbonic oxide inside the chamber in which the articles are placed for treatment. The Barff process is a direct one, the magnetic oxide being formed as an immediate result of the decomposition of water. The Bower process, on the other hand, is an intermittent one, the magnetic oxide being formed by a series of oxidizing and deoxidizing operations. The Barff is admittedly the better process of the two for wrought iron, but it is costly; while the Bower process is better for cast iron and steel, and is less expensive. In the former the chamber has to be heated externally, and the steam superheated by an independent furnace; while in the latter the heating is effected by an internal application of gaseous fuel, with the admission of air in certain definite proportions for effecting either the oxidizing or deoxodizing operations. The interest connected with the two inventions have been fused, and a furnace has been erected at St. Neot's, Hants, England, which embraces all the good points of the two separate furnaces, and in it are performed all the various operations of producing carbonic oxide, generating and superheating steam, heating the chamber by either an outside or an inside application of gaseous fuel, and treating in it either wrought or cast iron at pleasure, the process involving a sensible reduction in the working cost. It is now working on a practical scale, and as there is no deterioration in the material thus treated, it would seem that we have here an effectual means of protecting the surfaces of iron and steel used for constructive purposes, while in respect of articles of those metals for domestic and general use and for art purposes there is a wide field open, the Bower process giving to the articles treated a delicate but permanent French-grey tint. It has further been discovered that the process of enameling is facilitated and considerably reduced in cost by oxidizing the articles before enameling them.

Pittsburgh Industries.—The report of the Pittsburgh Chamber of Commerce states that the manufactories number 1,380; cash capital invested, $105,401,481; number of hands employed, 85,436; value of annual product, $144,721,619. The crucible steel works, it is observed, are the largest in the world. The class of manufactories, with the number of establishments, are as follows: Agricultural implements, 5; boilers, tanks, etc., 12; bridge iron, 3; domestic hardware, 5; founders, machinists, etc., 35; files, 5; guns, pistols, etc., 5; iron rolling mills, 36; iron blast furnaces 16; iron railing and fences, 6; iron roofs, cornices, etc., 3; miscellaneous lead and iron, 7; railway supplies, 6; steel 17; saws and tools 6; stoves 7; safes, fireproof 4; steam-pumps, 3. There are in Pittsburgh and vicinity seven large crucible steel plants; also two open-hearth steel plants and three Bessemer plants, one of these again being known the world over for its immense output. There is also one steel casting plant in successful operation, and another is being built. Pittsburgh steel, of fine grade, now competes successfully with all of the fine steels in the world. There is no kind of steel used, from the finest drill rod and needle wire, fine cutlery, lathe axle, and all tool steel, to the heaviest plates and shafts, that are not made, and as well made, as they are in any country.

Making of Dressing Combs.—In the manufacture of ordinary dressing-combs two distinct processes of tooth-cutting are followed. The first method, which is applied to all fine combs, consists in cutting out the teeth by means of circular saws, and this is the only process applicable to the preparation of small-toothed combs, and all combs made of ivory and boxwood. Saw-cutting is, moreover, the only process formerly adopted, but, instead of a circular saw, the comb-maker used a gauged hand-saw, called a "stadda" or "steady." The saws now employed are of small diameter, and, according to the work they have to perform, they are fine-toothed and thin, some of them being constructed to cut from 70 to 80 teeth per lineal inch. The saws are mounted on a spindle which revolves with great rapidity, and the plate or plates of horn to be toothed are clamped up in a holder, which, by a cam motion, is alternately raised and depressed, bringing the horn each time against the saw, which cuts out one tooth to its full depth. After each cut an automatic arrangement moves the horn forward the breadth of a tooth, the gearing being so mounted that the teeth may be cut fine or coarse at pleasure. The second method of cutting the teeth is known as twinning, from the fact that a pair of combs are cut out of a single plate. The process of twinning consists in so cutting a plate of horn that the whole material is utilized, what is removed to form the teeth of one comb being exactly sufficient for the teeth of a corresponding opposite comb. In order to economise tortoiseshell, and to obtain large and thick combs out of the comparatively small and thin plates in which that substance usually occurs, a process of cementing or soldering is resorted to. The joining of two plates of tortoiseshell is very perfectly accomplished by first carefuily scraping and cleaning the surfaces to be united. They are then applied to each other, heated, and strongly pressed between pincers, this being sufficient to cause a perfect amalgamation of the two surfaces. After cementation, tortoiseshell is treated in every respect as a piece of fine white or buffalo horn.

Over Production in Glass.—There is a tendency in this country to overdo everything. Fools build houses, says the old French proverb, and wise men live in them. Although the author of the above truism had no thought of glass houses in his mind when he thus expressed himself, his words have an especial fitness at present in view of the large number of glass factories now in course of building, or whose erection is contemplated in the near future, in this section of the country. Taking Pittsburgh as a center, we have reports of at least a dozen new glass-houses being put up within a radius of from 50 to 75 miles from here. As a general rule the increase or extension of existing facilities for the production of any particular line of goods should be an indication that the demand for such articles of manufacture is very large, and that either the supply is insufficient to meet that demand, or the prices are so high as to keep consumption restricted within the range of the productive capacity of establishments already at work. Neither of these conditions obtains here at present. Not only is there enough and more than enough of glass already turned out to meet all probable necessities, but the prices obtained for most articles of glass manufacture are so low as to be barely able to cover the cost of production; in some instances they fall below it. Over production is not confined to the manufacture of goods in quantities greater than what are required to supply the demand for them; its worst features are manifested in the turning out of wares in such quantities that their production involves no profit at all, and in some cases a positive loss. —*Amer. Pottery and Glassware Rep.*

Lights that Ride the Waves.—The illuminated buoy is a wonderful invention. Imagine an enormous lamp riding the waves. The buoy is a compact wrought iron vessel, which serves as a receiver for compressed gas. The duration of the flame depends upon the size of the buoy. Some in use in Europe have been made to burn 30 days, and some 120 days. It is said that a buoy of sufficient size will contain gas enough to furnish the light for one year. During that time the flame is steady and constant night and day, requiring no attention whatever after once put in operation. The lantern attached to the buoy admits air enough to feed the flame, but not a particle of water can enter. The most violent gales, the greatest force of the waves, submerging even beneath them, has no effect upon this light. It burns with undimmed brightness as long as gas is in its reservoir. The light, it is said, can be thrown six or seven miles in clear weather. Salty deposits are not made on the glass of the lanterns, as has been demonstrated. The refilling of the buoy at certain intervals is performed by a tender, and requires but a few minutes' time. It is done by passing the gas from a storeholder, which contains the gas compressed to 10 atmospheres, by means of a flexible tube into the buoy to a pressure of 6 atmospheres.

RAILROADS AND TRAFFIC.

THE Columbus (O.,) and Glenwood Rapid Transit Railway Company has been incorporated.

THE Lake Shore Railroad Company is constructing a spur track for the use of the Enterprise Machine Company, at Geneva, O.

THE Pennsylvania Railroad, in order to increase its facilities, will expend this year between $8,000,000 and $9,000,000, equal to only two per cent. of the capital of all its lines.

THE Boston and Albany Railway Company has discharged twenty-five per cent. of the force employed in its shops in Springfield, Boston, and Albany on account of the dullness in freight transportation.

THE preliminary survey has been made of the Columbus and Eastern Railroad, from Columbus, O., to Buckingham, in Perry County—a distance of about sixty-two miles. This road will penetrate the Perry county coal fields less than forty miles from the city, and will pass through the coal and iron region some twenty-four miles before reaching Buckingham—on Sunday Creek, half way between Corning and Shawnee.

THERE are in the world not far from 225,000 miles of railways; of this amount, this country possesses about 100,000—a little less than half. New York State has almost as many miles of road as all Asia, and more than all South America, while Massachusetts has more than all Africa.

THE Cleveland, Mount Vernon and Delaware Railroad will be sold at Akron on June 7. The appraisement is $1,700,000. It must be sold for at least two-thirds of that amount, and a cash payment of a portion of the price will be required.

THE track of the Cincinnati & Eastern (N. G.) has been extended to Newton, O., 10 miles east of Irvington, the recent terminus, and grading is in progress toward Portsmouth, about 40 miles beyond Newton.

EXPLOSION OF BOILERS.—Explosions have been known to occur from soot deposited in an entirely dry state on the flues and other parts of the boiler. When the fire is put out the air, loaded with moisture, enters and converts the soot into a paste; the oxidation of the sulphurous acid then occurs and the iron is attacked. The corrosive action is thus going on all the while the boiler is not at work, in parts that cannot be cleaned out, whilst no such action occurs where the soot has been cleaned away. The attack may occur while the boiler is heated, through an escape of water from the boiler itself, or by seeping through the brickwork. Excessive firing is the cause of many explosions. The intense heat repels the water from the surface of the iron directly over the fire and allows the boiler to be burned. Numerous instances are on record of strong boilers, well made in all respects and handled with care, having suddenly exploded with terrific violence, just at the instant that the valve was opened to admit steam to the cylinder, after the engine had been standing, or at the moment when cold water was injected into the boiler. The usually received explanation for this class of explosions is that by opening the valve or throwing in cold water the pressure of steam on the surface of the water is suddenly reduced, whereupon the water charged, as it is, with the tremendous energy of its heat, leaps from its place, divides and strikes with the solidity and force of cannon balls, against the interior walls of the boiler, tearing everything to pieces with its resistless momentum. At 60lbs. pressure to the square inch, every cubic foot of boiler-water has the energy of a pound of gunpowder, given the proper conditions for discharging that energy against the boiler. Another theory is that when water is superheated it explodes by bursting into steam by reduction of pressure. This last theory is probably the correct one, and may account for the total absence of water in many of this class of explosions, when it was known that there was plenty of water in the boiler just before the explosion happened. In each of these theories the cause is the same—superheated water. To guard against such accidents, in case the engine has been standing for a time, after turning on the feed water to keep up the circulation, dampen the fire with fresh fuel, and the heat that would have been transmitted to the boiler will be absorbed by the fresh coal.

REVIEWS.

The Complete Practical Machinist, Embracing Lathe Work, Vise Work, Drills and Drilling, Taps and Dies, Hardening and Tempering, the Making and Use of Tools, Tool Grinding, Marking Out Work, &c. By JOSHUA ROSE. Illustrated by one hundred and ninety-six engravings. Eighth Edition, revised and enlarged by the addition of much new matter. (Price $2.50, including postage.) PHILADELPHIA: Henry Carey Baird & Co., 810 Walnut street.

This new and improved edition of a thoroughly practical work will be welcome to machinists throughout the country. Its value arises from its thorough treatment of each topic, and the clearness of the descriptions which are aided by numerous illustrations. Nothing, in short, would seem to have been overlooked by Mr. Rose to render the work serviceable. The preface states: "In the revision the same familiar work-shop description of work-shop processes that characterized the former editions has been preserved, to the end that the book may be perfectly intelligible to the apprentice, the skilled machinist, and the student. In the description of lathe and machine tools, the special duties to which they are put together with the specific action of each are enumerated, and many valuable suggestions are given. The chapter on Cutting Speed and Feed is particularly interesting. It takes into account varying conditions, and affords the basis of calculation in carefully collated tables for steel, wrought iron, cast iron and copper. We select the following suggestive paragraph:

On heavy work it is specially desirable to have the tool stand a long time without being taken out to grind, for the following reasons: 1. It takes longer to stop and start the lathe, and to take out and replace the tool. 2. It takes longer to readjust the tool to its cut. 3. It takes more time to put the feed motion into gear again. 4. The feed motion is very slow to travel the tool up and into its cut, and to take up its play or lost motion. 5. Lastly, the tool should take a great many more feet of cut at one grinding than is the case with a tool for small work.

Boring tools for use in lathe work is a most important section, and the information given will prove valuable. The best forms of tools, and the reasons why such forms are the best, are presented. The precise action of the tools is made as clear as sunlight, and the ways in which they can be best handled to advantage are set forth. Screw-cutting tools are very ably dealt with, and in the section relating to them the means are given of calculating the gear wheels necessary to cut a thread in lathe work. An able exposition is furnished of the turning of eccentrics, which concludes with directions as to belting. We have never met with a better exposition of drilling and grinding in the lathe, and boring of bars than that which appears in this work. Subsequent chapters are on laps, twist drills, tool steel, laps and dies, vise work, with its special tools, (this supplying a plenitude of information,) fitting of connecting rods, milling machines and tools, and grindstone and tool grinding. In the chapter on lining and marking out work emphasis is placed on the importance of accuracy and directions given by which it may be secured. The methods are given by which to calculate the speed of wheels, pulleys, &c. The slide valve, its movements, and the means of setting it, are described and illustrated. The last chapter is on pumps. We heartily recommend this work to those for whose use it is intended. We have only to add that it is admirably indexed.

Poems of Edgar Allan Poe. With Memoir. Illustrated. EASTON, PA.: Rutledge Publishing Co.

This is an elegant edition of Poe, a poet who united to a rich imagination the power of stirring feeling and sentiment to their inmost depths. There is ever an alliance between the painter and the poet's art, and brilliant lights are here set off at times by deepest shadow. The gifted son of song was of ever changeful moods, which are reflected in his compositions. These are poems that leave their lasting impress on the mind, abounding with passion, and at the same time rich in glorious thought. There is a musical cadence in all, a fine example of which is "The City in the Sea." Philosophic thoughts, born of a mind eminently analytical, are woven with his depicture of scenes, events and characters; but it is as the poet of emotion that Poe stands in solitary grandeur, the builder of a fame that will be lasting. In addition to his completed poems are essays on the Poetic Principles, the Philosophy of Composition, and the power of Words. The memoir of Poe will be read with interest. The illustrations are graphic, and the work contains a portrait of the poet, executed in steel. The present tasteful edition should be in every library.

The Study of Words. By Richard Chenevix Trench. Complete in two parts. New York: J. Fitzgerald & Co, 143 4th Avenue.

This standard work is in some sense a dictionary to the English tongue. It is in no sense a "school-book," but rather a series of charming discourses upon the poetry in words, the morality in words, the rise of new words, the distinction of words—in short, every phase of this most attractive study.

Ericsson's New Caloric Engine.

Ericsson commenced the attempt to construct caloric engines with failures; he has now achieved a success. In principle his new engine is very simple, being the application of the alternate expansion and contraction of air by heating and cooling. It consists of a cylinder from 6 to 12 inches in diameter, in which is confined a fixed volume of air which is never changed. At the bottom of the cylinder the fire is applied, and extending part way down the sides is a water jacket. This air is alternately warmed at the bottom by the fire and cooled at the top by the water jacket, through which the water which is being pumped flows. Near the top of the cylinder is fitted a single-acting piston, and when the air is heated and expands it forces the piston up, and when the air is cooled and contracts the piston is carried down by the action of the fly wheel and the pressure of the air outside. In the cylinder is a large hollow displacement piston or cylinder which moves in a direction directly opposite to that of the regular piston, and is operated by means of a bell crank. This displacement piston or cylinder is placed there in order to render it certain that the air will be alternately warmed and cooled, which it does in the following manner: If the air is at the bottom of the cylinder it becomes heated by the fire, and the large displacement piston decends and forces it upwards, where it acts through its expansive force upon the regular piston, and is soon cooled by coming in contact with the water jacket, while the displacement piston rising again forces it down to the bottom, where it is again heated by the fire. The application of power is made by means of a small beam attached to the piston and one end is attached to the fly-wheel by means of a connecting rod and the other end is attached to the pump link. The heat at the bottom may be applied by either a gas or a coal furnace. The capacity of the engine varies with different sizes from 200 gallons per hour, 50 feet high for a six inch cylinder, to 1600 gallons per hour, 50 feet high for a 16 inch cylinder.

Mistakes.

"Mistakes" as they are called, says the London (Eng.) *Mechanical World*, are generally the reresult of carelessness or ignorance, and are a prolific source of "accident" when they occur in an engineering establishment. The mischief is they are frequently more easily made than detected, and hence their discovery and the legal necessity to hold a coroner's inquest arises too often at the same time. We imagine that carelessness and ignorance joined in the production of the mounting of a safety-valve some years ago. This was fitted to a boiler which soon after exploded from some "mysterious" cause, and caused death and injury to several "individuals." No explanation of this accident was ever made public, but we learn from the best authority that an engineer walking over the ruins shortly afterwards came across the casting on which the valve seating was formed. This was broken, and the fracture revealed to him the fact that there was no communication between the valve and the interior of the boiler. The pressage as designed, was curved, and the core had broken in the mould, thus allowing the metal to occupy a portion of its space, and form a steam-tight partition in the bend, where it could not be seen from either end. Gross as this mistake was it had ultimately a double beneficial result, for it set the engineer thinking. The out-come of his cogitation was one of the best known safety-valves of past years, which for a long time had no rival. Thus the public benefited, while the engineer kept his own counsel and made his fortune. The cause of this "accident" —the breaking of a curbed core in the mold—has frequently been overlooked and should always be sought by testing such passages.

MARKETS.

FINANCIAL.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, May 19.

There has been a moderate demand for money. Discount is 7 to 8 per cent., and on call 5 per cent. on prime collaterals. Local securities are more active. There is a fair demand for Eastern Exchange.

IRON.

The trade in pig iron continues in much the same position. Furnace men state that the bulk of the outlet is absorbed, but the business in open market is light. No tendency to further decline in price has been manifested. Buyers are still inclined to purchase only according to current requirements. No. 1 X Foundry is generally quoted $25 to $25 50, No 2 X $24 to $24 50, and Grey Forge $22 to $22.50 at furnace. Foreign brands are cheaper. We quote Coltness $25 to $24.50; Gartsherrie in yard $26; Glengarnock, $24 to $24.50. Summerlee $25, Carnbroe $23 to $23.50; Eglinton $22.50 to 23. We quote: Steel rails $53 at mill; steel boiler plates, 7c per lb. Iron rails are dull, and only occasional sales transpire, at prices ranging from $44 to $48, according to weight. Old rails are lower, and though nominally held at $27@$28 for American, and $26@27 for foreign, these figures must be shaded to effect transactions. There is a fair demand for the best makes of blooms. Sales are made at about the following quotations, viz.: Charcoal Blooms, $72.50@$75; Run-out Anthracite, $60@$62.50; Scrap Blooms, $52.50@55; and Northern Ore Blooms, $47.50@$50. Scrap iron is dull, and our quotations elsewhere unaltered. We quote bars $2.50; sheet $4.25 for No. 24; tank $3.50; boiler tubes 40 per cent. off list. The market for sheet iron has a somewhat downward tendency. Prices are as follows for small lots: Common sheet, No. 27 and 28, $5.05; common sheet, No. 26, $4.75; common sheet, No. 22 to 25, $4.50; common sheet, No. 16 to 21, $4.25. Best refined ¼c@½c. advance on the above. Best bloom sheets, No. 26 to 28 7c; best bloom sheets No. 22 to 25, 6¾c.; best bloom sheets No. 16 to 21, 6½c; common red plates, 3-16 to 16, $3.05; blue annealed, 3-16 to 16, 3.08; best bloom galvanized, discount, 35c.; second quality, discount, 45c.

CINCINNATI--(Reported by Rogers, Brown & Co.) The market has shown more activity since last report. Some considerable lots of neutral grey forge iron have been sold at about $21 cash at Cincinnati. These and other large forward orders have engaged a considerable portion of the product of Southern furnaces until midsummer. One large furnace, which blew in last month, has sold its entire product until the middle of August. Hanging Rock charcoal and raw coal kinds have settled slightly in values. Mills in this district are pursuing the policy of buying only enough to last until June 1st. The demand for foundry grades is steady, but confined to small lots. The following are our quotations for four months:

Foundry, Hanging Rock, C. C., No 1, $28.00@$29.00; No. 2, $27.00@$28 00; Southern, No. 1, $26.00@27.00; Strong Coke, No. 1, $25.00@26.0 ; No. 2, $24.00@25.00; No. 3, $24.00@24.00; Soft Stone coal No. 1, $23 00@25.00; No. 2, $22.00@$24.00. Forge--Strong, Neutral, No. 1, Mill, strong, $21.50@$23 00; Cold Short, No 1 Mill $20.00@22.00. Car Wheel and Malleable Hanging Rock Cold Blast, $34@35; Hanging Rock Warm Blast, $27@29; Southern Car Wheel Iron $35@37; Lake Superior, $32@34; Lake Superior Malleable, $32@$34.

CINCINNATI—Reported by E. L. Harper & Co — There is scarcely any change in the condition of the market. At quite low figures several very large orders have been placed for Grey Forge coke irons, and at figures shading the current market prices numerous liberal orders have been booked. The rolling mills, however, are generally apprehensive of labor difficulties, and are purchasing for immediate wants only. The stocks at the furnaces are light, but with the continuance of exceedingly limited demands from consumers in general the furnaces may be enabled to accumulate sufficiently to balance supply and demand, and the present condition of things be protected into the heated term.

COPPER.

The market is quiet, and we quote 18c@18¼c for Lake Ingot; Baltimore 17¼@17¾, and Arizona 18c. Increasing confidence is felt that the companies will not succeed in keeping up the present price of lake. Considerable arrivals of copper may be looked for next week, and these will test the price. The price that could be commanded in Europe would be at least 2½ cents below that ruling here. The combination prices of manufactured copper are unchanged. We quote Sheathing 28c; Braziers', 30@32c; Bolt, 30c; copper bottoms, 31@32c; American yellow sheathing metal, 16c. in bond.

LEAD.

The market is quiet and easier, and carload lots are quoted at $4.85. Jobbing prices are 5¼@5½c. Refined nominally quoted at $5 to $5.05. Manufacturers' prices are unchanged. We quote bar, 6¾c; pipe, 7¼c; sheet, 8c; tinned lined pipe, 15c; tin pipe, 35c. All less ten per cent.

TIN AND TIN PLATES.

The London market for tin has declined to £95. The market is quiet in a wholesale way, but is a little firmer. We quote 22@22¼c. The jobbing quotations are 22¾@23c. For tin plates the demand is good at firm prices. We quote: Charcoal bright, $6.50@6.75; Ternes at $6.00@8.00; cokes, $5.50; do Ternes, $5.50@5.75.

COAL.

The deliveries of coal from the coal regions the past week have been light, and shipments moderate. Charters have been effected for Milwaukee, Chicago and Green Bay, at 75c; Racine, 85c; Marquette, 60c; Duluth, $90; Portage Lake 75c; Toronto & Hamilton, $1.15; Kingston, $1.15.

HARDWARE.

The country trade is large, and a good business is being done in farming implements, as rakes, snathes, scythes, &c., and in carpenter's tools. A good demand has set in for lawn mowers, ice-cream freezers, &c. There is a special activity in horse nails and horse shoes. For barb wire the demand is active. Nails are fairly active, but buyers are looking for concession on large lots asked, which makers prefer not to give. About $3.25 represents the average price. Competition is keen, and lower rates in the absence of greater demand are probable. Pipes are quiet and firm at 65 off. The Lock Manufacturers' Association have confirmed existing prices. The regular monthly meeting of the Atlantic States Nail Manufacturers' Association was held on the 9th inst.

LUMBER.

Arrivals of lumber have been considerable. Prices are well sustained and distribution is fair. Buyers, unless they can purchase lower than last winter, will only at present purchase for immediate requirements. Piece stuff, short lengths, boards, strips and lathes, are in demand. On hard woods there is a brisk run. Walnut is firm, with good sales. The demand is good for white wood, oak, ash, maple, &c

LUMBER.

PLANK, MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2	$50
A 3	40
B	32
C	21
D	15
E	13

1¼ and 1½ inch.

A 1 and 2	$18
A 3	40
B select	32
C	21
D	15
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	20
D	15
E	13

STOCK BOARDS.
12 Inches wide.

A 1 and 2	$45
A 3	38
B	32
C	21
D	16

STRIPS.
6 Inches wide.

A 1 and 2	$42
B	35
C	22
D	17
E	13
Norway Fencing Strips	17
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3	$42
B	38
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$15
18 feet and under	$16

Timber, larger than 8x8 special.
Timber, longer than 18 feet, adds about $1 per foot per M. extra.

Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$4 50
Clear Butts	3 25
Lath	3 00

Surfacing, one side, adds $1.50; two sides $2.
Matching flooring and drop sidings, $2.50.

FOR SALE.

One 15-H.P., mounted Threshing Machine.
One 10-H. P. Threshing Machine.
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OVER THE BLUE GRASS ROUTE OF OHIO.

COMMENCING May 21st, 1882, we will run Sunday Church Trains as follows: Leave Millersburg 7:00 a. m., stopping at all intermediate stations, arrive at Columbus 10:20 a. m., in time for church. Return, leave Columbus at 4:00 p. m.

Trains North leave Millersburg 7:50 a. m., arrive at Hudson 10:30 a. m., and return at 4:30 p.m. This will enable parties to attend church at Akron, Cuyahoga Falls, or Hudson, and return home the same day. Round trip Sunday tickets at greatly reduced rates will be sold on Sundays, —good for that day only. E. T. AFFLECK, Gen'l Pass'r Agt.

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Locomotive Cylinder Boring Machine.

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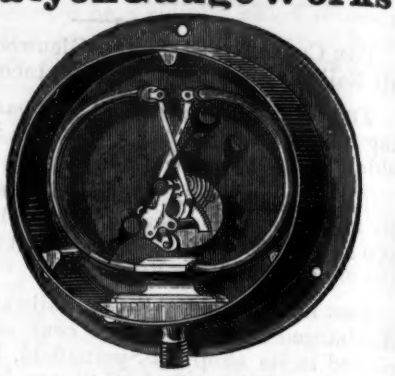
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All kinds of Gauges repaired at short notice.

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Holland Lubricator,
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Operating with downward visible drop. The principle of this Lubricant is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other patented Lubricator, being protected with Letters Patent, granted July 5, 1881.
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NEW & SECOND-HAND
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Machine and Blacksmith Tools of every description.
Woodworking Machinery in all its Branches, Portable Engines, Upright and Horizontal Stationary Engines, 1 to 300 horse power, Locomotive Fire-box, Upright Boilers, 1 to 100 horse power, Waterwheels, Cotton and Woolen Machinery, Steam Pumps, Grist Mill Machinery, &c., &c., &c.
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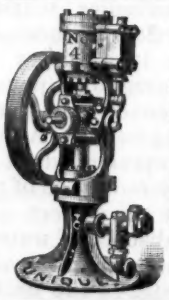
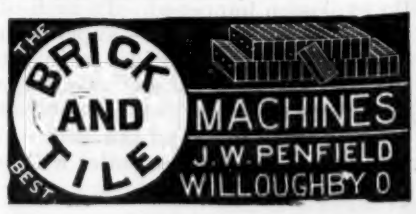
Manchester, N. H.
S. C. FORSAITH & CO.
Branch Office and Wareroom, 209 Center Street, New York.



THE MILLER CO.
Manufacturers of
THE TORRENT AND UNIQUE INDEPENDENT BOILER FEED
Steam Pumps,
Canton, Ohio.
For Boilers of from 5 to 150 H.P., with Base, or Bracket on smaller sizes! Price $30 and upwards. Small sizes indispensable for Farm and traction engines. Also make a specialty of all kinds of castings. Send for new 1882 Catalogue.



Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.... " " 19 50

Axes.

Hunt's.....℔ doz $ 9 50
Lippincott's Crown ℔ doz 9 00
Cut More ℔ doz 9 00
Peck's Double Bit ℔ doz 22 00
" Champion Blade ℔ doz 11 00

Anvils.

Eagle, Amer...per lb. 10c dis 20
Wright's.....10¾c@11c
Armitage's Mouse Hole 9⅛@9¾c
Trenton..... 10¾c
Wilkinson's..... 10¾c

Animal Pokes.

Berea, per doz..... 4 00
Eagle, per doz..... 5 00

Apple Parers.

Domestic & Reading ℔ doz. $7 50
Turn Table..... 5 00

Cleveland Stamped Elbows
Genuine Russia Iron

4 inch per doz..... 4 50
4½ do do..... 5 50
5 do do..... 7 50
5½ do do..... 8 50
6 do do..... 9 50
7 do do.....11 00

Planished American Russia Iron

4 inch, per doz..... 4 00
4½ do do..... 5 00
5 do do..... 6 50
5½ do do..... 7 50
6 do do..... 8 50
7 do do..... 9 50

Charcoal Iron

4 inch, per doz..... 2 00
4½ do do..... 2 50
5 do do..... 3 50
5½ do do..... 4 00
6 do do..... 4 50
7 do do..... 5 50
35 per cent

Augurs and Bits. Dis

C S cut augurs.....40@10
do do do bits.....40@10
D C gimlet do....$6.00 Gross
Snells bits..... dis 40
Russell Jennings' augers dis 16⅔ & 10&10
Cook's pat augur.....40@10@50
Post hole, net ℔ doz.....$21@24

Balances. Dis

Stillon's, Frary's, Morton's 15 10 per ct

Bellows. Dis

Blacksmith's com new list, 45℔ct
Moulder's new list, dis 25 ℔ cent
Hand, new list, 25 per cent

Bolts. Dis

Carriage and tire, com 80
do do Norway.. 65
Stove..... 40
Plow..... 50
Wagon..... 40
Machine & Square head 60
Skein,..... 60
Bolt ends,..... 60
Lag,..... 60
Tap,..... 60

Butts. Dis

Wrought brass..... 65&10
Cast, loose joint..... 10&10
Pin, japanned and silver tipped..... 45&10
Wrought, fast joint narrow..... 40&10
Wrought fast joint broad..... 40&10
Wrought loose joint broad..... 45&10
Wrought table and back flaps..... 40&10
Loose joint, reversible. 45&10

Chains.

Coil by cask,.....

3-16	¼	5-16	⅜	7-16	½
10½	9	8	7	6½	6¼

Crucibles.

Per number..... 4@ 4½

Novelty Clothes Wringers

Keystone per doz..... 42@45

Chisels.

Hot and cold cutting.....℔ lb 30
Railroad track..... 30
Machinists..... 30
Mallet head..... 50
Cape..... 50
Packing..... 50
Stone cutters..... 50

Crowbars.

Steel point..... ℔ lb 5
Cast steel..... 7½

Cutlery, Pocket and Table.

Meriden Cutlery Co, table..net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co...list net
Aaron Berkenshaw's pocket dis 25

Drills and Drill Stocks.

Blacksmiths', each...$2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W.....dis 20&10

Drawing Knives.

Discount.
Witherby's.....60@10 ℔ cent
Barton's.....15
Adjustable handle....10

Emery.

Genuine Chester..... 7@ 8
Wellington..... 10@12

Files.

Auburn...$5 to £. dis 35 pr cent
E. M. Boynton's, new list..dis 25
J. & Riley Carr.....4.50 to £.
Johnson & Bro.....dis 30
Butcher's.....4.50 to £.
Walter Spencer & Co.'s "Diamond"..... 4.50 to £.
Fisher's.....4.75 to £.
Moss & Gamble.....4.50 to £.
H. Disston & Sons (new list)..... dis 40 per cent
Heller Bros.' Horse Rasps dis 25
Nicholson.....dis 40
New American.....dis 40
Union File Co.....dis 40

Grindstones.

Ohio.....1¼@1⅝ ℔lb
Nova Scotia.....1¼@1½ ℔lb

Hatchets.

Yerkes & Plumb:--Shingling,
Nos.....1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 25
Claw,
Nos.....1, 2, 3,
℔ doz $8 25, $8 75, $9 25, dis 25
Lathing,
Nos.....1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 25

Horse Rasps.

Heller's.....dis per cent 30
"Arcade"..... 50 & 20

Harrow Teeth.

Iron ⅝ to 1 inch.....per lb 3¾c
Steel, square..... 4¾c

Hammers.

Mason's stone hammers, steel faced and pene.....℔ lb 18
Mason's stone hammers, solid cast steel..... 23
B. S. Napping hammers 30
Striking hammers, solid cast steel, 5 to 25 lb..... 18
Drilling hammers, solid cast steel, 3 to 6 lb..... 18
Turning hammers, full polished.....each 2 00
Set hammers.....℔ lb 35
Creasing hammers..... 35
Ordinary bush hammers 55

Nails.--BRADS AND FENCE.

10 to 60d..... 3 20
8 and 9d advance..... 25
6 and 7d..... do.... 50
4 and 5d..... 75
3d..... 1 50
2d..... 2 75
3d fine..... 3 00
2d fine..... 3 75
⅞ inch..... 3 00
4d barrel..... 1 00
1¼ inch barrel nails..... 1 50
1⅛ do do do..... 1 75
1 do do do..... 2 50
⅞ do do do..... 3 00
Cut spikes, all sizes..... 25
Clinch nails, all sizes..... 1 75
Casing and box nails 75 cts advance
Finishing nails, $1 25 do
Tobacco nails, 50 cts do

Nuts and Washers

Nuts, square .....7c off list.
Nuts, hexagon.. .... 7c. off list.
Washers.....6c off list.

Picks.

Railroad, 4 to 5 lbs...doz $7 75
5 to 6 lbs... 7 75
to 7 lbs... 8 50
7 to 8 lbs... 9 50
Railroad Tamping Pick.... 7 to 8 lbs..doz 13 50
Mill Picks per lb..... 75c

Rivets.

Iron.....dis 40
Tinned.....dis 40
Copper.....dis 33⅓

Squares. Dis

Steel or iron, case lots.....50
Try squares and T bevels.....40

Spikes—WROUGHT

All lengths by ¼ inch.....4¼c
do do do 5-16..... 3¼
do do do ⅜, 7-16 & ½ in 3¼

Shovels and Spades.

Ames' new list, July 1, 1881,..... dis 15
Old Colony.....dis 15
Remington's (Lowman's Patent).....dis 30
Rowland's.....dis 40 and 10
Griffiths.....dis 40&10

Shovels and Tongs.

Iron and Brass Head, R. & E. list.....dis 60&2
Polished Steel, new list dis 50&10&2

Sad Irons.

From 4 to 10 lbs....per lb 3¾ net
Self-Heating.....℔ doz $9 net
" Tailors..℔ doz $18 net
Gleason's Shield and Toilet.....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
Mrs. Pott's Irons, square back.....dis 35
Enterprise Star Irons.... dis 40
Combined Fluter and Sad Iron.....℔ doz $15, dis 15

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10.....dis 20
Stillman's Genuine, per doz $3 50 and $5 50.....dis 20
Stillman's Imitation, per doz $3 25.....dis 20&10
Common Lever, per doz $2 dis 30&10
Leach's No. 0 $8; No. 1 $15; dis 15
Hammer, Hotchkiss $5 50, dis 10
" Bemis & Call Co.'s new patent.....dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer..dis 30&5
Bemis & Call Co.'s Plate..dis 10
" " Cross-cut dis 12½
Aiken's Genuine...$13, dis 50&10
" Imitation.....$7, dis 50
Hart's Patent Lever.....dis 20
Disston's Circular.....dis 40

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Planes.

Ohio Tool Co.....dis 20
Sciota.....dis 25
Bailey's Pat. Adjustable. dis 25

Rules.

Stanley.....dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"..42
Simmons' Sash Supporters...20

Hinges.

Champion double acting spring hinges.....dis. 30
Screw & Strap 8@12 in.....$6. net
Gravity Locking Blind Hinges, Sargeant & Co. 70&10

Screws. Dis

Flat head iron or steel per cent dis.....30
Flat head brass.....30
Round head iron or steel..25
Round head brass.....20
Brass and Silver capped..40
Japanned, list of Plain Screws.....20
Coach, patent Gimlet point, list per 100.....60
Lag, taper points.....60
Bed.....10
Machine, flat head, iron..55
round head, iron 50
Bench, iron.....55&10
wood, beech, per doz $3.....10
wood, hickory.....20&10

Scales. Dis

Fairbanks'.....25

Tank Iron.

3-16, ¼ and ⅝ inch thick.... 3 20

Tacks. Dis

Black.....30—10
Tin'd.....50

Traps. Dis

New House.....30
Peck, Stow & Co.....50—10

Vises.

Solid box, Dis.....40

Wrenches.

Coe's genuine.....40 & 10
Coe's imitation wrought bar..40
Mechanics'.....60 and 10

Wire.

Brass and Copper.....dis 20
Bright & annealed, Nos. 0 @ 18 dis 50@52½
" " Nos. 19 @ 26 dis 60
" " Nos. 27 @ 36 dis 65
Coppered.....Nos. 0 @ 18, dis 45
Galvanized, Nos. 0 @ 18, market list,.....dis 40@45
Tinned, Nos. 0 @ 18,....dis 40@45
Cast steel.....dis 40
Tinned Broom Wire, Nos. 18 @ 25.....dis 55
Annealed Fence, Nos. 8 and 9.....dis 55@52½
Annealed Grape, Nos. 10 to 14.....dis 52½
Galvanized Telegraph, Nos. 7 to 9.....℔ lb 7¼c
Galvanized Telegraph, Nos. 10 to 11.....℔ lb 8¼c
Galvanized Telegraph, No 12.....℔ lb 10¼c
Fence staples.....℔ lb 5½@5¾c
Fence Staples, galvanized, ℔ lb 7@7¼c
Stubs Steel Wire....$7 00 to £
Barb Wire, painted..... 8¼c
Barb Wire, galvanized.....9¼c
Crucible Steel Ropes from ⅜ in. at 9c to 1¼ in. at.....52c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at.....33c

Boiler Plates.

("Gaylord"--Standard Quality.)

C. No. 1.....1 50
C. H. No. 1 Shell.....4 60
C. H. No. 1, 50,000.....5 00
C. H. No. 1, 55,000.....5 50
C. H. No. 1 Flange.....6 00
Firebox
T. S., 60,000.....(as per)..6 00
T. S., 65,000.....(act of)
Homo. Steel, 70,000 (of Cong)..8 00
Heads, ¼c ℔ lb. extra.

N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ℔ lb less than above prices.

Boiler Rivets—"Albany."

⅛, ¼, 11-16, and ¾ in. diam.5 50

Sheet and Tank Rivets.
"Norway."

All sizes.....dis. 15

Nuts, Bolts, etc.

Square & Hex. Nuts....7 off list
Washers.....6 off list
Machine Bolts.....dis 55
Bolt Ends.....dis 55
Boiler Patch Bolts.....net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch.....dis 25
"National" Special Locomotive Tubes.....net list

Boiler Makers' Tools.

Doty's Power Shears....net list
" Hand Lever Shears..net list
" Power Punch.....net list
" Hand Punch.....net list
Steel Screw Punch.....net list
Iron Screw Punch.....net list
Boiler Plate Rolls.....net list
Buffalo Forges & Blowers dis 20
Watson's " " net list
Spring Tube Expander....dis 15
Roller Tube Expander..net list
National Tube Cleaner...dis 20
Wire Flue Brushes.....net list
Anvils—"Peter Wright" 12½℔lb
Solid Box Vises.....net list

IRON AND STEEL.

Flat Bar.

1⅛ to 4 by ⅜ to 1 inch..... 2 50
4¼ to 6 by ⅜ to 1 inch..... 2 60
1⅜ to 6 by 1⅛ to 1½ inch.... 2 90
1¼ & 1¾ by ⅜ to ⅜..... 2 60
1 & 1¼ by ⅜ to ⅜..... 2 70
⅝ ¾ and ⅞ by ⅜ to ⅝..... 2 90

Round.

1 to 1⅞ inch..... 2 50
2 to 2⅝..... 2 70
2⅝ to 3¼..... 3 00
3⅜ to 4..... 3 50
4¼ to 4½..... 4 00
4⅜ to 5..... 4 20

Square.

1 to 1⅞ inch..... 2 50
2 to 2⅝..... 2 70
2⅝ to 3¼..... 3 00
3⅜ to 4..... 3 50
¾ to ⅞..... 2 60

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch. 2 70
1 to 1¾ by ¼ and 5-16 do 2 80
⅝ to ⅞ by ¼ and 5-16 do 3 00
⅝ to ½ by ¼ and 5-16 do 3 50

Half Oval and Half Round.

Wagon box iron ¾ and ⅞.. 4 00
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¼ to 6 by ¼ to 3-16..... 3 00

Hoops.

1¼ to 2 , Nos 16 to 18..... 3 40
1¼ to 4 do 13 to 15..... 3 30
1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24..... 4 50
No 25 to 26..... 4 70
No 27..... 4 90
No 28..... 5 30

English Steel.

Best cast.....℔ lb 15½c
Extra cast..... 16½c
Round machinery, cast 14c
Swaged, cast..... 18c
Best double shear..... 15½c
Blister, 1st quality.... 13c
Refined tool steel..... 16½c
Spring calking..... 7¼@7½c
German steel, best.... 11c
2d quality..... 10c
3d quality..... 9c
Sheet cast steel, 1st quality..... 15½c
2d quality..... 14½c
3d quality..... 12½c

American Steel.

Best brands of refined cast steel..... 12c
Crucible machinery.... 8c
Open-hearth ditto..... 5c
Hammer cast steel..... 9½c
Spring cast steel..... 7½c
Bessemer and open-hearth spring..... 5½c
Ditto plow..... 5½c
Steel boiler plate..... 6½@7c
Bessemer machinery.. 5 @6c
Spring and calking.....7¼@7½c
Tire..... 5
Sleigh shoes..... 5

Bessemer Steel Tire.

¾ to 1 by 3-32..... 4½ ℔ lb
¾ to 1 by ½ to 5-32..... 4½ ℔ lb
¾ to 1 by 3-16 to ¼..... 4½ ℔ lb

Miscellaneous Cast Steel.

Auger and auger bit..... 8
Axle steel for wagons..... 8
Frog points and plates..... 9
Frog size bars..... 7½
Pick, plain..... 10
Mattock, beveled..... 9
Table cutlery..... 8½
Trap spring steel..... 9
Pike and cant hook..... 8½
Coal and granite..... 8½

TINNER'S STOCK.

Tin Plate.

10x14 IC charcoal.....$8 25
do IX do..... 8 25
12x12 IC do..... 6 00
do IX do..... 8 50
14x20 IC do..... 6 50
do IX do.....$6 25@7 50
DC, 12½x17 do..... 6 00
DX 12½x17 do..... 8 00
For each additional X add 2 00
IC 10x14} coke.....$5 75@5 50
IC 12x12 do.....5 00@5 75

Tin.

Banca.....per lb. 28c
Straits..... " 25c
English..... " 25c
Spot Tin..... " 25c

Solder.

½ and ⅜.....16½c
Extra.....15½c
No. 1.....13½c

Pat Planished Sheet Iron.

{A} ..... per lb 10½c
{B} 9½c

Nos 10 15 21 25
to 14 20 24 & 26
Com 3-60 3-80 4-00 4-20
Char 5-60 5-60 6-00 6-20
Sheets over 28 in. wide ¼c extra

Sheet Iron.

Galvanized, No 10 to 20℔ lb 8½a7¼
do do 22 to 24 9 a8
do do 25 to 26 10 a8½
do do 27 10¾a9
do do 28 11¾a9½
dis, 40
Russia Iron.....12½@12c
American Cold Rolled ....5@7½

Zinc.

Sheet, cask..... 7½@ 7½
Sheet, open..... 8@ 8½

Tinners' Tools & Machines.

Machines (P. S. & W.) list add 20
Tools (P. S. & W.) .....add 6

LEAD.

American, ℔ lb..... 5½c
Bar, ℔ lb..... 6½c net
Pipe, ℔ lb 7½c dis 10 per ct
Sheet, ℔ lb.. 8c dis 10 per ct
Tin-lined pipe ℔ lb 15c dis 10 per ct
Shot Drop 7c; Buck.... 8c
Chilled Shot..... 8c

COPPER.

Lake Ingot..... 18@18½c
Baltimore..... 17¼@17¾c
Arizona..... 18c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb.....30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 32c
Brazier's Copper, 10 oz. and 12 oz. per sq. ft...per lb. 34c
Brazier's Copper lighter than 10 oz. per sq. ft...per lb 36c
Circles less than 84 inches in diameter...per lb. 33c
Circles 84 inches in diameter and over.....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz. per sq. ft.....per lb. 28c
Bolt Copper.....per lb. 30c
Copper Bottoms..per lb. 31@32c

No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18..... per sheet 6c
All other size sheets, 2½c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

Net Tons.

No. 1 wrought scrap..... $24
Sheet and hoop " ..... 10@11
Cast scrap, (No. 1 heavy). 19
Cast Scrap (Stove Plate). 12

OLD METALS.

Old copper per lb..... 15c
No. 1 H. Brass per lb..... 14
Heavy yellow Brass do..... 12
Light Brass per lb..... 12
Scrap Zinc per lb..... 6
Tea Lead per lb..... 3
Heavy Lead per lb..... 4

BRASS.

Cash prices for Roll and Sheet Brass For less quantity than 100 lbs. add 3c per lb

High Brass

All Nos not thinner than 16 No 28 wider than 2 in. not wider than 14 inch..... 30c
All Nos to No. 28, inclusive, and widths over 14 to 20 in. inclusive..... 35c
All Nos to No 28, inclusive, and widths over 20 to 30 in. inclusive..... 38c
½c per lb. advance on each No above Nos. 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at..... 53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c per lb. more than High Brass.
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars..... 48c
Sawed..... 51c
Planed or Polished...54c

For Slitting.

Metal in width in. to ¼ in. to No. 28, inclusive, 1c per lb advance.
Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb. advance.
Metal, in width ½ in. to ¼ in. thinner than No. 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths, add 7c per pound.

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1..	19	28	1.31	1.67
1¼..	27	40	1.66	2.36
1½..	33	47	1.90	2.69
2..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5..	2 25	3 00	5.56	14.56
6..	2 75	4 00	6.62	18.76
7..	3 75	....	7.62	23.00
8..	4 75	....	8.62	28.00
9..	6 50	....	9.68	34.40
10..	8 00	....	10.75	40.64
12..	12 00	....		54.65

Discount, plain, 55 per cent; galvanized, 52½ per cent.

Gas and Steam Fitters' and Machinists' Supplies.

Gas and Steam Pipe—See Pipe Wrought.
Enameled Pipe.....dis 65
Artesian Well Casing....net list
Hydraulic Tubes.....net list
Malleable Iron Fittings..net list
Cast Iron Fittings.....dis. 55
Globe Valves.....dis. 50
Angle Valves.....dis. 45
Check Valves.....dis. 45
Safety Valves.....dis. 45
Eddy Gate Valves.....dis. 20
Steam Cocks.....dis. 45
Service Cocks.....dis. 45
Ball Gauge Cocks (net per dozen).....$15
Compression Gauge Cocks dis. 45
Miss. Gauge Cocks.....dis. 45
Register Gauge Cocks (net per dozen).....$15
Cylinder Cocks.....dis. 45
Air Cocks (net per dozen)..$2 75
Oil Cups.....dis. 45
Steam Gauges.....dis. 35
Water Gauges.....dis. 45
Scotch Glass Tubes.....dis. 60
Steam Whistles.....dis. 45
Iron Body Globe Valves..dis. 55
Iron Body Safety Valves..dis. 55
Iron Body Steam Cocks..dis. 55
Pipe Tools.....special
Globe, Angle and Check Valves (Powell's regrinding).....dis. 45
Guarantee "Jet Pumps" dis 40
Mack's Injectors.....dis. 25

Babbitt Metal.

N. P. U.....℔ lb @9c
A. 28c., B. 25c., C. 15c.

COAL,

WHOLESALE.

Wholesale f.o.b vessel at Cleveland:

Carbon Hill and Monday Creek.....$2 65
Massillon..... 2 85
Brier Hill..... 3 50@3 75
Pittsburgh..... 3 00
Salineville..... 2 50
Tuscarawas..... 2 25

RETAIL.—Delivered.

Massillon Lump.....$4 00
" Nut..... 3 75
Carbon Hill and Monday Creek, lump..... 3 75
Carbon Hill and Monday Creek, nut..... 3 50
75c less on cars by car load.
Anthracite Stove and Chestnut..... 7 15
Egg and grate..... 6 00

Hides and Leather.

Prime cured hides, 8@
Green hides..... 6@6¼
Bull, scrubby, badly scored or damaged, cured, two-thirds price.
Prime dry hides..... 13@14
Horse hides, green $1 75@2 00
Horse hides, dry.....$2 00@2 25
Prime cured veal calf. 12¼
Prime Deacon Skins, salted 60c
Pelts, wool on.. 32@34
Fresh slaughter sheep 30@$1.50
Fresh slaughter lambs 50@60
Green calf skins..... 18
Hemlock rough..... 23@24
Oak harness..... 35@39
Oak sole..... 37@40
Union harness..... 32@35

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15..... 7 50
11x14 to 15x24..... 8 50
16x24 to 20x28..... 9 75
15x34 to 24x30..... 10 75
26x28 to 24x36..... 11 50
26x36 to 26x44..... 18
26x46 to 30x50..... 14 00

DOUBLE THICKNESS

6x8 to 10x15..... 11 7
11x14 to 15x24..... 13 25
16x24 to 20x28..... 15 75
15x34 to 24x30..... 17 25
26x28 to 24x36..... 18 50
26x36 to 26x44..... 21 25
30x50..... 22 50
30x52 to 30x54..... 23 25
30x56 to 34x56..... 25 00
34x58 to 34x60..... 27 75
36x60 to 40x60..... 30 00
Dis 60 & 15 single, 60 & 20 double

OILS & AXLE GREASE

Pure Oils. packages included

Sperm, winter bleached per gal..... @1 15
Elephant, winter bleached, per gal.... @ 70
Whale, winter bleached per gal..... 60@ 65
Seal, winter bleached 80@ 85
Bank oil..... 48@ 51
Straits..... 50@ 53
"A" oil for tanner's use 35@ 40
Lard oil extra W S....1 00@1 05
do No 1 do..... 80@ 85
do No 2 do..... 67@ 72
Tallow oil..... 65@ 72
Neatsfoot oil pure.... 1 05
do No 1..... 80
Linseed oil, raw..... 60
Linseed oil boiled..... 63
Cotton seed oil white.. 64@ 66
do do yellow 60@ 63
Carbon oil Ohio legal test..... 9½@11¼
West Virginia lubricating 28 deg..... @ 29
Pure Mecca..... 55@ 60
Paraffine oil winter pressed gray 25 ...
do lo do 25@ 30
Machinery..... 40
Engine..... 50
Miners' oil..... 40@45
Drilling oil..... 40

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W, E, Ana ytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT — (Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .98 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furnture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 203 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER. G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 365 Euclid Avenue.

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Distillers.

BLOCH, S. H. & E., Distillers, and wholesale dealers in Kentucky Whiskies. 66 Water St.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Annunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 83[a] Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

VIADUCT FOUNDRY COM'Y, Aenis, Carlin & Strangward manfrs of Machinery Castings Fine Light Castings a Specialty. Office & Works 11 13 15 and 17 Detroit Strert, near Center.

ECLIPSE IRON WORKS manufacture Castings of all kinds. Cor. Center & Winslow Sts

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Grindstones.

OHIO GRINDSTONE CO. manufacturers of and dealers in Grindstones. 127 Superior st.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL, Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed lumber, timber, lath shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 231 Merwin streets.

Cleveland Business Directory.

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 36 South Water Street.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals, Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 23 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnishes. Brushes, 34 Prospect st.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 52 Canal Street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio

JOHNSON & PURSER, Stair Builders and manuf'rs of Mantels, Odd Pieces of Furniture, &c. 30 West street. up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO, Rubber Stamps, Seals, Stencils. 197 Superior street.

Tanners.

GAENSSLEN BROS., Tanners, and dealers in leather, oil and shoe findings. 80 Water-st.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O.

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

McNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

Alliance, O.

ARLINGTON HOUSE, cor. Main and Liberty Streets. Centrally located. Sample Room for Commercial Travellers. H. S. Adams, proprietor

McFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

COLUMBUS MACHINE CO. manfrs. of Blowing, Stationary and Portable Engines, Brass and Iron Castings. West End Nat. Road Bridge.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

RAGAN W. H. & CO., manfrs of Doors, Sash and Blinds, Mouldings, Casings, Balusters, Newels, Hand-railing, and Builders' Mill Work of every description. Cor. West Broad & Center.

Business Directory.

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

EBERSOLE & KAILEY, Machine and Jobbing Shops. Gearing for Patterns or Machinery a specialty. Models of all kinds made & repaired.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

SNYDER, H. wholesale manu acturer of Sash, Doors, Blinds, &c. Send for Price Lists.

THE CUYAHOGA FORGE AND IRON CO., manfrs. of every description Car, Truck and Driving Axles, Forging, Shafting &c.

Canal Dover, O.

HECKMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Garrettsville, O.

UDALL & NILES Foundry and Machine Shop. General repairing and jobbing on short notice

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Massillon, O.

TREMONT HOUSE, Jas. M. Clark, proprietor. Terms $1.50 per day. Good sample room for Commercial Travellers.

CITY CARRIAGE WORKS, P. H. Young, prop. manfact'r of Carriages, Phætons and Spring Wagons. Work warranted. Cor. Tremont & Erie.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'fr's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Steubenville, O.

DORRANCE, D.W., Tool Works, manufacturer of hand-made miners' and stone-cutters' Tools Promp attention given to mail orders.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels, Banded Hub Wheels, Jacobs' Patent Neck Yokes.

WOOLWORTH, JAMES, manfr. of Axe, Pick, Sledge and Auger Handles, Hickory Whip Stocks, &c. Established in 1855.

FULTON MACHINE WORKS & FOUNDRY, Barney & Kirby, proprietors, manfrs. of Stationary and Portable Engines and Boilers, Rolling Mill Machinery, Circular Saw Mills, etc.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, mnfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets.

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description. All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing machines, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Titusville, Pa.

FOSTER & McKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Rochester, Pa,

OLIVE STOVE WORKS, (limited) manufacturers of Stoves and Hollow Ware.

Business Directory.

Erie, Pa.

ERIE STEAM BENDING WORKS. H. G. Fink, prop'r, manufacturer of Bent Felloes, poles, snafts, bob runners, etc. Cor. 12th & Cherry.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 283 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 30 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FEUGEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Meadville, Pa.

CURRY & CO. general jobbers in Castings of al kinds.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and iron castings, light and heavy, made on short notice.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting, manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

BAIR & GAZZAM, practical machinists; gear cutting a specialty. Rice's Feed Water and Heater. 17 Wood street, corner First Avenue.

Wheeling, W. Va.

EXCELSIOR MACHINE WORKS, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulies, Shafting, &c. Cor. 18th & Chapline streets.

Louisville, Ky,

HAIGHT, ROBERT, Gold, Silver and Nickel Plating and Brass Finishing Shop. Car Trimmings and Steamboat work a specialty. 1 West Market street

Union City, Ind.

LAMBERT, J. W. & CO., mfrs of fork, rake, hoe and broom handles; spokes, hubs, whiffletrees, yokes, plow-rounds, &c. Correspondence solicited.

Olean, N. Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Rochester, N. Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches. spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

KELLY, PETER, Boiler Maker, Mill street, cor. Furnace. Sheet iron work made to order.

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

KINGSBURY, G. J., Cracker and Oven Machinery Works. Shawmut Building, Mill St.

WISEMAN, Albine, manufacturer of all kinds of Shoemakers' Tools. 117 North Water St.

ULSCHT & LINN mfrs of Wood Lathes, Engraving Machinery, &c 131 N. Water street

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Ulscht, Linn & Co. 131 N. Water

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling machines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r, manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I. J. manfrs of Coopers' Tools, Carpenters Tools, Draw Shaves, Cleavers Choppers, Ship Tools, &c. 312 Exchange street.

THE BUFFALO NUT AND BOLT CO [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No. 226 Ohio Street.

Rheims, N. Y.

GREAT WESTERN CHAMPAGNE. Finest made in America. Equal to best imported. Has taken highest awards everywhere, and is used all over the Continent. Try a case, and you will have no other. Pleasant Valley Wine Co., Rheims, N. Y.

Brattleboro', Vt,

A JOY FOREVER!

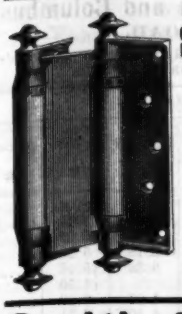
ESTEY ORGANS

Manufactured by

J. ESTEY & CO.,

Brattleboro', Vt.

(Catalogue free on application.)



THE COMPOUND
SPIRAL SPRING HINGE,
has the lightest and
Most Elastic Movement
Combined with
THE GREAEST POWER.
Manufactured by
LORENZO BOMMER,
84 Pearl Street, cor. Front,
BROOKLYN N.Y.

Smith & Curtiss,

JOBBERS OF

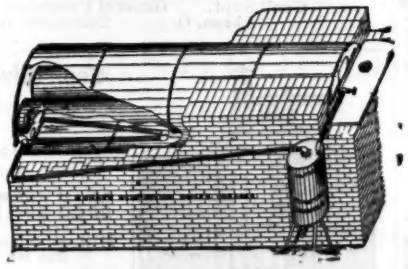
TEAS,

COFFEES AND SPICES

ALSO PROPRIETORS OF THE
CLEVELAND
Coffee and Spice Mills,
107 & 109 Bank Street,
Cleveland, O.

JUDSON'S PATENTED
SECTIONAL
Assay Furnaces
AND APPLIANCES.
Model Furnace for 1881,
All steel, light and durable, with Revolving Grate, etc. Also
Judson's Practical Stoking Attachment
Guaranteed to feed coal, coke or charcoal without choking the draft.
Manufactured only by the patentee,
W. E. JUDSON,
Cleveland, O

SHARP'S



SELF-ACTING BOILER CLEANER.

Patented November 23, 1880.
THOS. SHARP & CO.
SALEM, OHIO.
Send for Circular and Price List.
[Mention this paper.]

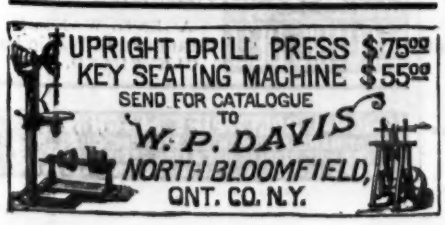
Portable Mulay Saw Mill,

With improvements recently made is unequaled as a neighborhood mill. It can be run by either steam or water power, and is especially adapted to the engines used for threshing.

It may be operated by either two or three men, and will cut as much lumber in proportion to the power and number of hands employed as mills of larger capacity.

It makes smooth and even lumber, leaves no stubshot, and will cut any sized log up to four feet in diameter.
It may be transported from one locality to another and re-erected ready for sawing in from two to three days, and can be made profitable in localities where there is not sufficient timber to justify the erection of a large mill. Send for descriptive circular, price, etc., to
CHANDLER & TAYLOR, Indianapolis, Indiana

P.S.—We are also building a very superior Pony Circular Saw Mill suited to light power and medium sized logs.



C. S. BARRETT, President. P. ARNOLD, Superintendent.

Dover Fire Brick Co.,

MANUFACTURERS OF

Fire Brick of all Shapes and Sizes,

— AND —

Shippers of Fine Ground Fire Clay.

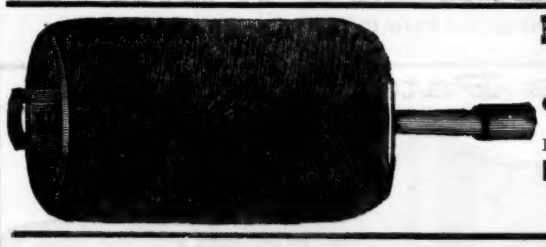
Office--101¼ Water Street, Cleveland.

Truck Hubs.

Black Birch Carriage, Wagon and
TRUCK HUBS.
Sizes from 3½x6½ to 18x22.
R. M. WHITNEY,
OLEAN, Cattaragus Co., N. Y.

Practical Lithographer.

CHAS. F. SCHMIDT,
PRACTICAL
Lithographer, Engraver
AND PRINTER,
Room 12 Bratenahl's Block, cor. Superior and South Water Streets, Cleveland, O.
Correspondence solicited from Manufacturers.



Patent Steel Tube and Flue Brush.
Best in the Market.
Made any size required.
Combines the properties of a Scraper and Brush.
Full stock always on hand.
L. B. Flanders Machine Works
1025 Hamilton street,
PHILADELPHIA, PA.

JOSEPH M. DOWNING.

UNION TUBE WORKS, NEWCASTLE, PA.

MANUFACTURER OF

LAP WELDED BOILER TUBES

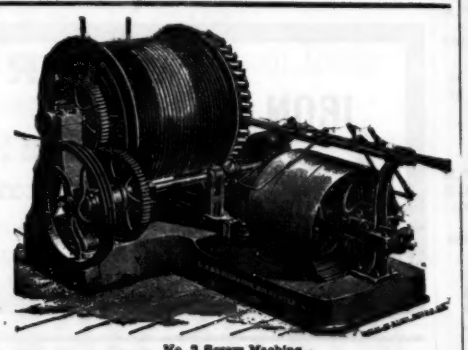
FROM BEST AMERICAN

Charcoal Hammered Iron.

Freight and Passenger

Elevators.

L. S. GRAVES & SON,
Cor. Center and Frank Streets,
ROCHESTER, N. Y.



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No. 3 Screw Machine.

EDWARD C. POST,
Successor to Smith & Post,
Manufacturer of
Hydraulic and Steam Power Passenger and Freight

ELEVATORS,

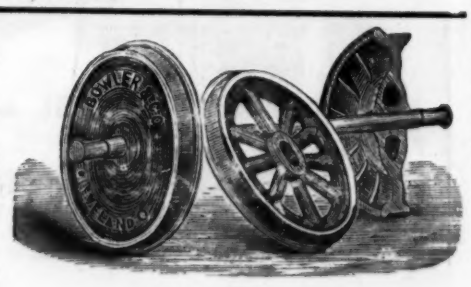
HAND ELEVATORS, Etc., Etc.

Shafting, Pulleys and Hangers, Etc.

Send for Circulars and Price List.
CORNER ST. CLAIR & WASHINGTON STREETS,
TOLEDO, OHIO.

Cleveland Foundry.

CASTINGS
For Machinery and Rolling Mills.
Car Wheels
all sizes and kinds, with and without Axles.
Chilled Faced R. R. Frogs.
STREET RAILROAD TURNOUT
Nos. 9, 11, and 13 Winter Street.
BOWLER & CO.



G. M. HEARD & CO.

Gold, Silver & Nickel Platers

109 Ontario Street.
CLEVELAND, O.

B. F. Roberts,

BOILER MAKER,

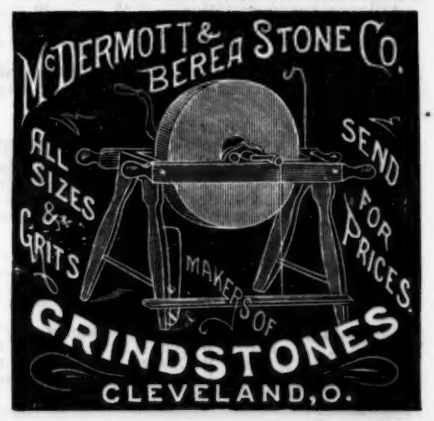
And Sheet Iron Worker.
BRIDGE STREET, SPRINGFIELD, OHIO
Special attention paid to taking out and Piecing Portable Flues.
Orders by mail to B. F. Roberts, Springfield, Ohio, promptly attended to.

E. F. ENSIGN,
JOBBER OF

Agricultural Implements,

WAGONS, FERTILIZERS, SEEDS, &C.
The Empire Grain and Fertilizer Drill and Twine Binding Harvesters Specialties.
134 ST CLAIR STREET, CLEVELAND, O

Springfield Brass Foundry.
Pattern and Model Work a Specialty.
Castings done in White Metal, Brass, Zinc, Type Metal, Pig Lead, Pig Tin, Bar Lead, Bar Tin, Antimony, Copper, Spelter, &c., &c.
Cash paid for Old Brass and Copper
McLAUGHLIN & SHILLING.
68 South Limestone Street,
SPRINGFIELD, O.



PURE PREMIUM BONE.

The tried and never failing Fertilizer in all grains and grass crops. It has proved its value as such by years of actual use all over the world. Circulars and Price List free. Address all letters pertaining to the purchase of Premium Bone, or the sale of bones, to **Excelsior Fertilizer Works,** Salem, Columbiana County Ohio.

TRAVELERS' REGISTER.

Lake Shore & Michigan Southern.

Trains marked with a * are the only trains that arrive and depart in this city on Sundays.

EAST BOUND TRAINS.

	Arrive.	Depart.
No. 20 Limited Express	*1:35 A M	*1.50 A.M
No. 6 Atlantic Express	*7:05	*7 30
No. 10 Buffalo Accom	11:00	11.15
No. 8 C. & St. L. Exp.	*2:25 P M	*2.55 P.M
No. 4 Special N. Y. Exp	10:10	10.35
No. 2 San. Div. Accom.	10:12	
No. 12 Conneaut Accom.		4.50
Nottigham Accommodation (Sundays only)	10.05 A.M / 4 45 P.M	9.00 A.M / 2 15 P.M
No. 18 Elyria Accom.	8.50 A.M	

WEST BOUND TRAINS.

	Arrive.	Depart.
No. 13 Mich. Accom.		6.40 A M
No. 1 Special Chicago Ex.	*6 35 A.M	7.00
No. 3 Toledo Express	1.25 P.M	3.30 P.M
No. 21 St. Louis Express	*1.40	*2.05
No. 5 Pacific Express	*7.05	*7.35
No. 11 Conneaut Accom.	8.40 A.M	
No. 19 Pt. Clinton Accom.		5.00
No. 7 Michigan Exp.	*2.50 A M	*3.05 A.M
No. 17 N. Y. & Chi. Ex.	11.43 P.M	11.53 P.M

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'pons Ex.	*7 10 A.M
No. 8 C. T. V. & W. & Clev Accom.	10 30
No. 12 St. Louis & New York Exp.	*3 00 P.M
No. 4 Special Cin. & New York Exp.	*3 40
No. 10 Wheeling & Cleveland Exp.	8 30
No. 6 Indianapolis & Columbus Exp.	10 20

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A.M
No. 11 Cleve, Indianap. & Wheel'g Ex.	7 10
No. 3 St. Louis & Cincinnati Ex.	†2 00 P.M
No. 5 Night Express.	*7 25
No. 7 C. T. V. & W. & Col. Accom.	4 00

†This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

No. 4 Wheeling & Cleve'd Exp.	8 25 P.M
No. 2 Uhrichsville Accom.	10 30 A.M

DEPARTURES.

No. 1 Wheeling & Cleve'd Exp.	7 15 A.M
No. 3 Uhrichsville Accom.	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo.	10 55 A.M
No. 3 New York Express,	*7 00 P.M
No. 1 New York Express,	6 50 A.M
No. 3 Pittsburgh Express,	*7 00 P.M
No. 5 Pittsburgh Express,	3 10
New York Express	3 10
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 12 New York Express,	*7 10 A.M
No. 4 Youngstown Local,	11 15
No. 8 Mahoning Accommodation,	4 25 P.M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A.M
No. 6 Pittsburgh & Main Line Express.	2 30 P.M

Cleveland & Pittsburgh.

	DEPARTURES.	ARRIVE.
Mail	8 00 A.M	1 15 P.M
Express	1 25 P.M	7 30
Alliance Accommodation	3 45	10 10 A.M
Ravenna Accommodation	5 35	8 35
Night Express	†11 40 P.M	6 30 A.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.	DEPARTURES.
No. 2 Accom. 10 15 A.M	No. 1 Mail 8 15 A.M
No. 6 Express 1 35 P.M	No. 3 Accom. 2 20 P.M
No. 4 Mail 6 30 P.M	No. 5 Exp. 6 05

Trains leave from Depot foot of South Water Street.

Special trains leave on Sunday at 8.30 A. M. and 4.20 P. M., arriving at Cleveland at 10 A. M. and 6.25 P. M.

Connotton Valley Railway.

Arrive.	Depart.
No. 1 10 05 A.M	No. 4 4 00 P.M
No. 3 7 15 P.M	No. 2 8 10 A.M

All trains arrive and leave depot corner Commercial and Fifth Streets.

NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.

Started instantly by a Match, it gives full power immediately.

When stopped all expense ceases.

No explosions; no fires nor cinders; no gauges; no pumps; no engineer or other attendant while running.

Unsurpassed in every respect for hoisting in warehouses, printing, ventilating, running small shops, &c., 2, 4 and 7 H.P. and upwards. Built by

Schleicher, Schumm & Co., PHILADELPHIA.

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ESTABLISHED 1835.

Removed from 13 Water to Corner 23d and Smallman Streets, PITTSBURGH, PA.

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Stills, Tanks and Sheet Iron Work

of all descriptions made to order on short notice. Have on hand a large stock

New and Good Second Hand Boilers.

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Dayton Malleable Iron Co.,

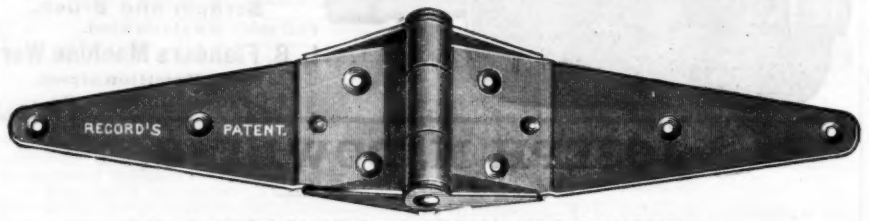
Manufacturers of

Air Furnace Iron.

A full line of Carriage and Plow Hardware kept in stock.

Catalogues for the Trade.

Record's Patent Hinge.



THE MAIN PART of this Hinge is of the same style as the ordinary heavy strap. The joint is strengthened by FLANGED SUPPORTS, made of extra quality of iron, spanning the entire width of each leaf, firmly riveted to the back of the hinge. The pintle of the hinge passes through the ear of the flange, thus adding greatly to its strength. Also, by the additional thickness of iron, greatly STIFFENING THE HINGE where most liable to bend, and secure against breaking where the greatest part of the STRAIN COMES. As the straps of the hinge are bent down, forming an offset for the reception of the supports, the hinge is smooth or flat on the back, same as the ordinary hinge. These hinges are neat in appearance, and owing to their great strength admitting of smaller sizes being used than heretofore, renders them the most economical, as well as the most desirable hinges made. They are applied the same as ordinary hinges.

PRICES PER DOZEN PAIRS.

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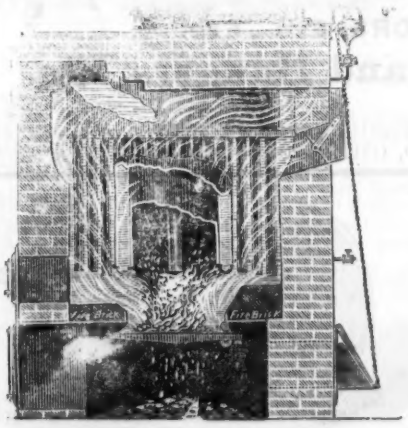

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Cleveland, Akron and Columbus RAILROAD.

Trains leave and arrive daily (Sundays excepted) at the points named below.

GOING SOUTH.

STATIONS. February 20, '82.	Miles	Mail and Expr 2	Thro' Pass'gr 4	Accom 6	Accom 8
		A.M.	P.M.	P M.	
Cleveland		8.00	1.50	3.45	
Hudson (1)	0	9.15	3.00	5.05	
Cuyahoga Falls	8	9.32	3.18	5.23	
Akron (2)	14	9.47	3.33	5.36 / 5.50	
Clinton	27	10.17	4 04	6.23	
Warwick	28	10 23	4.10	6 31	
Marshallville	33	10 35	4.23	6.45	
Orrville (4)	39	10.51	4.43	7.03	
Fredricksburg	52	11.22	5.16	7.37	
Holmesville	56	11.34	5 28	7.52	A. M.
Millersburg	62	11 48	5.41	8.05	5.40
		P.M.			
Killbuck	68	12.02	5 55		5.54
Black Creek	74	12.16	6.09		6.08
Gann	82	12.41	6.35		6.33 / 6.53
Danville	86	12.55	6.49		7 07
Howard	91	1.05	6.59		7.18
Gambier	95	1.15	7.11		7.29
Mt. Vernon (5)	100	1.30	7.27		7.43
Mt. Liberty	109	1.58	7.47		7.59
Centerburg (6)	114	2.08	7.57		8.10
Condit	120	2.22	8.11		8.24
Sunbury	124	2.31	8 20		8.35
Galena	126	2.36	8.26		8.41
Westerville	133	2.51	8.42		8.58
Columbus (7)	145	3.15	9.06		9.22

GOING NORTH.

STATIONS. February 20, '82.	-	Thro' Pass'gr 1	Mail Expr 3	Accom 5	Accom 7
		A.M.	P.M		P.M.
Columbus	0	6.00	12.15		5.05
Westerville	12	6 25	12.41		5.32
Galena	19	6.41	12.57		5.49
Sunbury	21	6.47	1.03		5.55
Condit	25	6.56	1.13		6.06
Centerburg	31	7.10	1.27		6.20
Mt. Liberty	36	7.20	1.38		6.32
Mt. Vernon	45	7.43	2.02		6.59
Gambier	50	7.55	2.15		7.11
Howard	54	8.05	2.25		7.23
Danville	59	8.15	2.36		7.34
Gann	63	8.30	2.50		7.49
Black Creek	71	8.56	3.15		8.15
Killbuck	77	9.10	3.28		8.29
				A. M.	
Millersburg	83	9.26	3.43	5.50	8.42
Holmesville	89	9.37	3.55	6.05	
Fredricksburg	93	9.49	4.06	6.18	
Orrville	106	10.23	4.43	6.50 / 7.10	
Marshallville	112	10.35	4 55	7.23	
Warwick	117	10.46	5.09	7.37	
Clinton	118	10.52	5.15	7.46	
Akron	131	11.28	5.47	8.22	
Cuyahoga Falls	137	11.41	6.00	8.35	
Hudson	145	12.00 M	6.18	8.55	
Cleveland		1.15 P M	7.25	10.10	

N. MONSARRAT, Gen'l Supt. Akron, O

E. T. AFFLECK, General Passenger Ag't, Columbus, O.

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Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg. 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:25 p.m.; Washington, 7:30 a.m.; Baltimore, 8:15 a.m; via Sharon and Sharpsville to Meadville 7:40 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:30 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 10:00 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 1:08 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:55 a.m., and 1:18 p.m. and 4:20 p.m.

11:15 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 2:10 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 3:10, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

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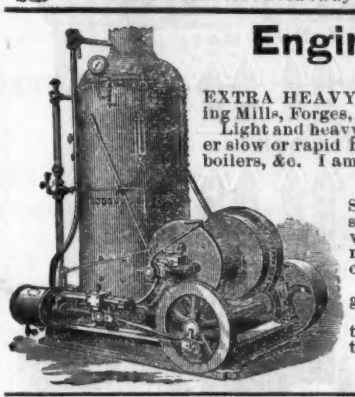

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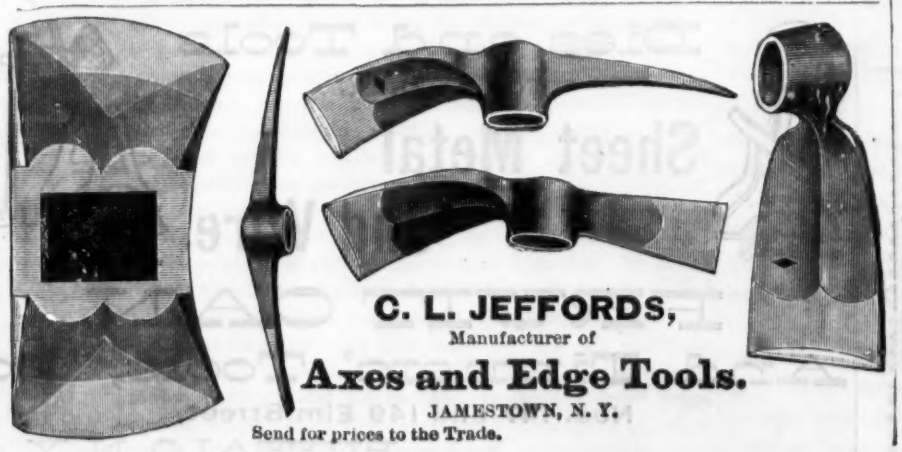

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CLEVELAND & PITTSBURGH RAILROAD.

Condensed Time Table of Passenger Trains, corrected to May 14, 1882.

MAIN LINE—GOING WEST.

	Day Expr'ss.	Mail Expr'ss.	Fast Line.	Accom.
Leave				
Pittsburgh	7 30 a m	2 00 pm	11 50 pm	.....
Allegheny	7 40	2 10	12 00 am	.....
Arrive				
Rochester	8 23	3 00	12 50	.....
Beaver	8 30	3 05	12 55	.....
E. Liverpool.	9 08	3 37	1 37	.....
Wellsville	9 18	3 47	1 50	.....
Salineville	9 57	4 31	2 33	.....
Bayard	10 34	5 07	3 21	.....
Alliance	11 05	5 30	3 55 am	.....
Leave				
Alliance	11 10	5 30	4 05	7 30 am
Arrive				
Ravenna	11 48	6 04	4 47	8 15
Hudson	12 13 p.m.	6 28	5 15	8 50
Cleveland	1 15 p.m.	7 30 pm	6 30 am	10 10 am

Accommodation train leaves Ravenna at 6.45 a. m., arrives Hudson 7.15 a.m., Cleveland 8.35 a.m.
☞ Fast Line and Western Express run Thro' Sleeping Car, Pittsburgh to Cleveland.
NOTE.—Fast Line leaves Pittsburgh Sunday nights, but not on Saturday nights.

MAIN LINE—GOING EAST.

	Pittsb'g Expr'ss.	Fast Line.	Day Expr'ss.	Accom.
Leave				
Cleveland	8 00 am	1 45 pm	11 40 pm	3 45 pm
Arrive				
Hudson	9 05	2 43	12 50 am	4 50
Ravenna	9 37	3 08	1 18	5 20
Alliance	10 20	3 40	2 05	6 05 pm
Bayard	10 54	4 03	2 49	.....
Salineville	11 40	4 37	3 40	.....
Wellsville	12 20 pm	5 14	4 35	.....
E. Liverpool.	12 54	5 44	4 57	.....
Beaver	1 30	6 17	5 47	.....
Rochester	1 35	6 22	5 52	.....
Allegheny	2 30	7 05	6 45 am	.....
Pittsburgh	2 40	7 15	6 55	.....
Harrisburg.	.....	3 50 am	4 00 pm	.....
Baltimore	.....	7 30	7 20	.....
Washington	.....	9 02	8 47	.....
Philadelphia	.....	7 20	7 35	.....
New York	.....	10 25	10 35	.....
Boston,	.....	8 00 pm	.....	.....

Accommodation train leaves Cleveland Union Depot at 5.35 p.m., arrives Hudson 6.55 p.m., Ravenna 7.25 p.m.
All trains connect at Yellow Creek for Wheeling and Bellaire.
☞ Fast Line runs Through Sleeper to New York. Day Express runs Through Sleeper to Pittsburgh.

TUSCARAWAS BRANCH.

Trains leave Bayard at 11.00 a.m. and 5.10 p.m. arrive Minerva 11.08 p.m and 5 20 p.m : arrive Dover 12.18 p.m. and 7.15 p.m., New Philadelphia 12.30 p.m. and 7.30 p m. Returning leave New Philadelphia at 7.00 a. m. and 2.05 p. m., Dover at 7.30 a.m. and 2.15 p m., Minerva at 9 45 a.m. and 3.23 p. m., arrive Bayard at 10.00 a.m. and 3.33 p.m.

All trains daily except Sunday.

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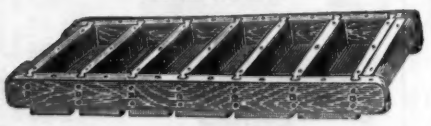

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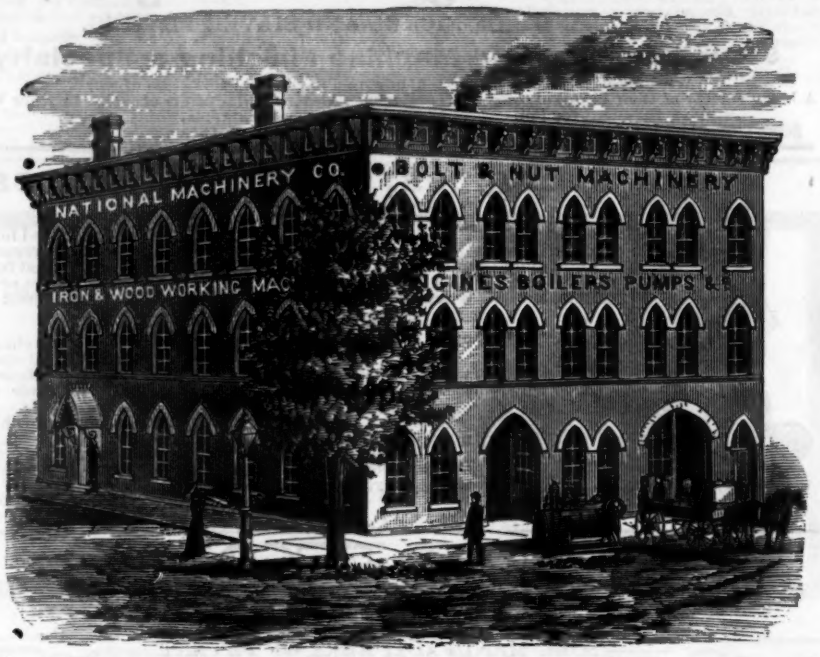

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